Sun StorEdge™ 3310 SCSI Array

Just the Facts

Partner/Reseller Version

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Positioning

Figure 1. The Sun StorEdge™ 3310 SCSI array

Introduction

Sun is proud to announce the new Sun StorEdge™ 3310 SCSI array. Targeted primarily at Sun's Volume Server Products, this robust Ultra160 SCSI LVD 2U-high array is a worthy successor to the well-established Sun StorEdge A1000/D1000 series arrays.

Sun has condensed high performance, high availability, and simple manageability into a flexible, versatile, reliable, rugged, cost-effective, super-scaling, high-density package. Each Sun StorEdge 3310 SCSI array holds twelve 1-inch high disks and is available with a single RAID controller, with dual redundant RAID controllers, or as a JBOD/expansion unit. The Sun StorEdge 3310 SCSI array can easily fulfill a wide variety of network computing storage requirements.

Customers of Sun's Volume Server products should find the Sun StorEdge 3310 SCSI array an excellent storage complement to complete their IT infrastructure. For example, a combination of a Sun Fire™ 480R server and a Sun StorEdge 3310 SCSI array can be a very capable application system serving a large number of nodes currently; or, for Tier One applications such as static web caching, the Sun StorEdge 3310 SCSI array can be mated to a cost-effective Netra™ 20 class server. Environments requiring higher levels of storage capacity such as database applications can obtain up to 1.3 TB of raw capacity by daisy-chaining up to three Sun StorEdge 3310 SCSI arrays together.

Highly scalable and highly condensed, the 2U-high/12-drive Sun StorEdge 3310 SCSI array holds one or two RAID controllers and supports up to two 2U-high/12-drive expansion arrays, for a total of up to 36 disks. As a key component in a storage network, this system connects to host servers via industry-standard PCI SCSI host bus-adapters, and to local/remote management consoles via standard SCSI, serial, and Ethernet connections.

This compact, ultra-dense, super-rugged disk array is designed to meet the wide range of Sun's Volume Server platform requirements by providing Sun storage customers with midrange/enterprise-class performance/availability features, management functionality, and configuration flexibility at volume (entry) level price points who require:

- **Affordability**: Midrange and enterprise features and functionality at entry-level price points.
- **Super condensed**: Extremely space-efficient, high-density, 12-drive 2U controller arrays support hundreds of gigabytes of storage, one or two controllers, 128 LUNs, and multiple host connections.
- **Intuitive, simple setup and management**: Single management GUI provides intuitive RAID and LUN configuration for every Sun StorEdge 3310 array in the environment.

- **Functionality**: Multi-LUN support with non-disruptive dynamic LUN expansion.
- **Flexibility**: Low-cost SCSI; choice of controller (JBOD, single, or dual) and midplane configurations; choice of RAID levels to match the cost of storage to the value of the data.
- **Scalability**: Cost-effectively grow from five drives to hundreds – from 180 GB to many TBs in single-drive increments; grow to 96 drives in one Sun StorEdge rack (8 arrays x 12 drives); to thousands of LUNs in a single rack.
- **Expandability**: Adding more capacity, performance, or availability is simple and thrifty. Grow capacity and I/O performance in single-drive increments or with low-cost expansion units. Grow throughput performance (bandwidth) one controller at a time. Increase availability with hot-swap redundant FRUs, RAID with global hot-sparing, and dual redundant controllers.
- **Reliability**: Full NEBS level 3 compliance and a sub-set of MIL-STD-810F compliant packaging can survive harsh environments and provide flexibility in installation location.
- **Configurability**: Virtually unlimited combinations of controllers, drives, RAID levels, RAID types (that is, hardware- or software-based), LUNs, and redundancy to match to virtually any application workload and critical data need.

Key Features

The initial release of the Sun StorEdge 3310 SCSI array includes the following features.

Feature	Specifications
Interface	Ultra160 SCSI LVD
Hard Disk Drives	At GA: 1-inch high low profile 36-GB, 10000-rpm Ultra160 LVD drives
Number of Drives	Per Controller array: 12 hot-swappable Per Expansion array: 12 hot-swappable Per 72-inch Sun StorEdge cabinet: 96 hot-swappable (12 drives x 8 arrays)
Rack Height of array	2U (appx. 3.5 inches high)
Sun Server Platform Support, Solaris Operating Environment	At GA: Sun Enterprise™ 220R, 420R, 250, 450; Sun Fire 280R, 480R, V880, V120; Netra 120, Netra 20, Netra t1400/1405, Sun Blade™ 1000/2000
Supported HBAs	X6758A – Dual-channel Ultra160 LVD PCI
Supported Solaris™ Operating Environment	Solaris 8, 9
Supported Non-Solaris Operating Environment	Sun Linux 5.0, on LX50 platform. Microsoft Windows NT 4.0/Windows 2000 Server, Red Hat Linux distribution v 7.3
Midplane Options	Concatenated bus (single) or split bus (dual), field-configurable
RAID/Bus Options	Single controller/single bus, single controller/dual bus, dual controller/dual bus, dual controller/single bus
RAID Level Support	RAID 0, 1, 0+1, 3, 5, 3+0, and 5+0, with global hot spare (where applicable)
Power Supply Options	100 to 240VAC or -48V or -60VDC dual hot-swap/redundant
Cooling	Hot-swap/redundant fans (integrated into PS units)

Feature	Specifications
RAID Controller	512-MB cache per controller; independent battery-backed cache per controller; 3 SCSI I/O ports per array; hot-swap redundant dual controller configurations; independent XOR engine; 128 LUNs per controller/controller pair; 256 command tag queues (CTQs) per controller/controller pair
Sun Cluster Software Support	Version 3.0
Daisy Chain Support	Yes, expansion units off of RAID controller equipped arrays
NEBS Compliance	Level 3 compliant, certified by Telcordia

Additional features of the Sun StorEdge 3310 SCSI array include the following:

- Density of 432-GB raw capacity in 2U format (with 36-GB drives)
- Redundant hot-swappable (FRUs)
  - Active/active RAID controller configuration
  - Event monitoring units (EMUs)
  - Two power supplies, each with power inlet
  - Two cooling fans integrated into each power supply FRU
- Hot-serviceable I/O and auto-termination boards (Power on but no I/O activity)
- In-band and out-of-band host-based terminal, GUI
- Non-disruptive firmware upgrades (requires dual controller configuration and Sun StorEdge Configuration Service software)
- Dynamic storage capacity expansion (DSCE) and dynamic LUN expansion (DLE)
- Event monitoring and reporting; component health monitoring: disk, power, thermal, fans; SAF-TE and SMART compliant
- Software support includes Sun Logical Volume Manager, Sun Cluster 3.0, VERITAS NetBackup, and VERITAS Volume Manager (VxVM) software

Product Family Placement

The following table below is a feature comparison of Sun's current storage array product line.

Sun StorEdge 3310 SCSI Array	Sun StorEdge A1000 and D1000 Arrays	Sun StorEdge A5X00 Array	Sun StorEdge T3 Array for the Workgroup
Workgroup	Workgroup	Workgroup	Workgroup
• Controller-based RAID • JBOD • Software-based RAID	• Controller-based RAID (A1000) • JBOD/SW-based RAID (D1000)	• JBOD • Software-based RAID	• Controller-based RAID (single controller)
• Solaris Operating Environment 8, 9 • Microsoft Windows NT 4.0 and Windows 2000 • Sun Linux 5.0 (LX50 platform) • Red Hat Linux v 7.3	• Solaris Operating Environment	• Solaris Operating Environment • Microsoft Windows NT	• Solaris Operating Environment • Microsoft Windows NT • HP-UX • Linux • IBM AIX
When to sell • Price/performance • Ultra160SCSI • High Availability including dual controllers and redundant components • NEBS Level 3 compliance • MIL-STD-810F subset compliance • When maximum storage density is desired or required (small footprint = 2U, 12 drives) • RAS + • High performance • Flexibility of configurations	When to sell • Installed base customers • For small-capacity applications	When to sell • Installed base customers • Price • Fibre Channel storage networking • Replaces SPARCstorage™ Array • High sequential performance (data warehousing) • Campus-area remote mirroring (up to 500m)	When to sell • One-array configurations • RAS + • Remote mirroring to 10 kilometers (using FC switches) • Mission-critical availability features • High-performance scalable data storage
When NOT to sell • Customer requires Fibre Channel • Customer requires SAN implementation	When NOT to sell • High performance situations • High density situations • Customer requires Fibre Channel today	When NOT to sell • Hardware RAID 5 required	When NOT to sell • High density situations • Data centers • 2-Gb FC required

Storage Feature Comparison

The table below provides a feature comparison for Sun's storage product line.

- Yes = Feature supported
- No = Feature not supported
- N/A = Not applicable for the specified array

Functionality/Attribute	Sun StorEdge 3310 SCSI Array	Sun StorEdge A1000 Array	Sun StorEdge D1000 Array	Sun StorEdge D2 Array
Form Factor (Rack/Disk Density)	2U	4U	4U	4U
Array-Based Hardware RAID x 2 Controllers	Yes	No	No	No
NEBS Level 3 Compliance	Yes	No	No	No
MIL-STD-810F Subset Compliance	Yes	No	No	No
Ultra160 SCSI LVD	Yes	No	No	Yes
128 LUNs (Total)	Yes	No	N/A	N/A
Two Host SCSI Ports	Yes	No	No	Yes
Lights Out Manageability	Yes	No	No	No
Online Dynamic Reconfiguration (LUN/Capacity)	Yes	No	No	No
Expansion Drive Array(s)	Yes	No	N/A	N/A
Split Bus or Single Bus Configurable	Yes	No	No	No
In-Band or Out-of-Band Management	Yes	No	No	No
Standard Cache Size	512 MB	24 MB	N/A	N/A
19-inch Depth for Telco Cabinets	Yes	Yes	Yes	Yes
AC/DC Power Supplies	Yes	Yes	Yes	No
Solaris Operating Environment Compatible Based RAID Manager	Yes	Yes	N/A	N/A
GUI/Terminal/Web-Based Manageability	Yes	Yes	N/A	N/A
Online Controller Firmware Upgrade	Yes	No	No	No
Component Health Monitoring	Yes	Yes	Yes	Yes
Sun Cluster 3.0 Software Support	Yes	Yes	Yes	Yes
Mirrored/Redundant Cache	Yes	No	N/A	N/A

Key Messages

1. Sun has developed a family of products delivering superior value to the workgroup by combining the power of key enterprise features with straight-forward characteristics

2. Adaptable: The new Sun StorEdge 3310 SCSI array gives Sun's customers a highly adaptable platform on which to deploy ever-changing business applications.

3. Integratable: The new Sun StorEdge 3000 series is tailored to Sun's workgroup servers, optimized for Solaris, and supports heterogeneous environments.

4. Straight forward characteristics = adaptability, manageability, density, simplicity.

5. Channel friendly = easy to sell with Sun servers, fits customer requirements, minimum configurations/reduced inventory, new market opportunity.

Target Applications

- Messaging (email or vmail)
- Accounting
- Customer relationship management
- Sales force automation
- E-commerce
- Supply chain management
- Internet applications
- Document management
- Directory services
- Enterprise resource planning
- Application/software development
- Small database (OTLP or DSS)
- Static web content delivery
- File and print
- Proxy caching
- Data warehousing/data mart
- Data analysis/decision support
- Dynamic web content delivery

Selling Highlights

Market Value Proposition

The Sun StorEdge SE3310 SCSI array delivers superior value to the volume storage market by combining powerful key enterprise features, functionality, and flexibility with workgroup simplicity.

Key Features, Technical Functions, and Benefits

Feature	Technical Function	Benefit
• Ultra160 SCSI LVD architecture	• Up to 160 MB/sec. raw bandwidth per channel	• Very fast access and transfer of information
• Dual hot-swappable event monitoring module	• Monitors and reports disk drive, power supply, and fan failure	• High availability - No single point of failure
• Dual hot-swap/redundant power supplies and fans	• If one fails, the other keeps the array running smoothly; dynamic replacement of failed unit does not disrupt production I/O	• Easy serviceability and enhanced system availability
• LVD SCSI signal	• Up to 12-meter cable length	• Separate server to array enclosure for ease of physical systems management
• RAID support with hot-swap/redundant drives and global hot sparing	• Quick, easy, dynamic failed drive replacement	• Easy serviceability; continuous operation
• One- or two-bus options	• Effectively provides two separate and distinct SCSI buses, each supporting 6 drives	• Easy field configuration for varied computing environments
• Single or dual RAID controller configurations	• One 2U array can be configured for standard RAID, or for high-availability RAID (hot-swap/redundant controllers with mirrored cache)	• Very flexible and highly versatile array has many uses and is easily and quickly adaptable to changing data storage needs
• Expansion arrays	• Daisy-chain to a RAID controller array	• Saves money; provides a cost-effective transaction-intensive configuration
• Industry-standard rack/system cabinet mounting	• Center post or four post compatibility	• Provides easy installation

Field-Replaceable Units (FRUs)

All of the Sun StorEdge 3310 SCSI array's major components are field-replaceable units (FRUs) and are easily accessible from the front or rear of the unit. Each FRU has a set of LEDs which indicate health and status of the array. Hot-swappable FRUs are quickly and easily replaced while the system remains up and running.

The Sun StorEdge 3310 SCSI array's FRUs include the following:

- **Hot-swappable**
  - RAID controllers
  - Two event monitor units (EMUs)
  - Two power supplies, AC or DC with integrated fan module (PSU)
  - Up to 12 Ultra160 SCSI LVD disk drives (hot-swappable)

System Architecture

The Sun StorEdge™ 3310 SCSI array enclosures are rackmountable, NEBS Level 3-compliant, mass storage subsystems. The 2U-high Sun StorEdge 3310 SCSI array utilizes the Ultra160 LVD SCSI interface both internally to the drives and externally to the host ports.

Configuration management and enclosure event reporting are enabled through an in-band SCSI or out-of-band 10/100 BASE-T Ethernet port and a DB9 serial port. Host-based software packages, such Sun StorEdge Configuration Service software, are available to interface for in-band management and event reporting. Sun StorEdge Configuration Service software can be also be launched in a web browser.

Each Sun StorEdge 3310 SCSI array RAID controller/drive array holds up to twelve 1-inch high (low profile) Ultra160 LVD SCSI disk drives and can support up to two expansion drive arrays. The Sun StorEdge 3310 SCSI array supports single or dual redundant SCSI-SCSI disk array controllers. Each Ultra160 SCSI LVD RAID controller has 512 MB of battery-backed data cache with intelligent caching algorithms and supports support RAID levels 0, 1, 0+1, 3, 5, 3+0, and 5+0; up to 128 LUNs; and 256 command tag queues (CTQs).

Note: *In BOTH single and dual controller configurations the maximum number of addressable LUNs is 128.*

Each 2U-high drive array can contain one or two identical 512-MB caching RAID controllers. When two paired RAID controllers are installed, they are configured for hot-swap redundancy and mirrored data cache so if either controller fails or is removed, the remaining controller takes over the workload (failover), allowing for fail-safe, continuous, online protection.

The midplane for one (single concatenated) or two (dual split) SCSI buses is quickly and easily configured via a short external patch cable (the cable is included with the array). Attaching the cable to create a single-bus configuration sets certain disk slots with unique SCSI target IDs on that bus. The label on the front of the chassis identifies the target IDs.

Each RAID controller can support up to two independent LVD host I/O ports.

Note: *In dual controller configurations, the maximum number of host I/O ports is still two.*

Both the 2U-high RAID controller and expansion drive arrays support up to 12 1-inch high (low-profile) Ultra160 LVD SCSI disk drives. A maximum configuration supports up to 36 disk drives (one RAID drive array plus two expansion drive arrays). Each drive array is connected to each other via an optional external SCSI cable. See the Ordering Information section of this document for all applicable cables and part numbers.

Dual hot-swap/redundant load-sharing/load-balancing 100 to 240VAC or -48 or -60VDC power supply units each have separate power inputs and contain two high-velocity (52 CFM) fans with detection circuitry to monitor degraded performance provides superior temperature control.

The enclosure reporting monitor (EMU) maintains the enclosure environmental control and status. The EMU monitors all internal +12 and +5 voltages per power supply. Seven temperature sensor locations and fan speeds from each are monitored by the EMU. The EMU controls front and rear panel display LEDs and buzzer alarm. The drive array supports dual failover EMU modules for fully redundant event monitoring safety. The Sun StorEdge 3310 SCSI arrays support SAF-TE protocol (SCSI Accessed Fault-Tolerant Enclosures) for reporting the environmental information from the EMUs onto the in-band SCSI bus.

Key Architectural Features

- High-performance embedded RAID controller with intelligent caching algorithms and four Ultra160 SCSI LVD external host/drive ports supports up to 128 LUNs and 256 command tag queues (CTQs)
- Independent battery-back module for each controller, capable of supporting 512-MB cache for ~72 hours
- Four controller configuration options: Single controller/single concatenated midplane, single controller/split midplane, dual controller/dual split midplane, or dual controller/single concatenated midplane
- Configuration management and enclosure event reporting enabled through in-band SCSI or out-of-band 10/100BASE-T Ethernet port and DB9 serial port
- RAID controllers (in dual controller configuration), disk drives, event monitor units (EMUs), and power supply/fan assemblies are all hot-swap/redundant, field-replaceable units (FRUs)
- All FRUs are easily accessible from the front or rear of the array
- Each array supports up to twelve hot-plug, 1-inch high (low-profile) Ultra160 SCSI LVD disk drives
- Each RAID array supports up to two expansion drive arrays, for up to 36 disks total
- Colored LED indicators provide FRU status as well as enclosure environmental and hardware status
- Transmissions up to 12 meters utilizing Ultra160 SCSI LVD cables
- Auto SCSI termination technology supported on external drive SCSI ports
- Single-bus or dual-bus configurations by simple external jumper cable connection
- Intelligent event monitor unit (EMU) monitors enclosure environmental information such as sensing various temperature sensors and obtaining voltage output status from each power supply – each EMU can enable the buzzer alarm for audible alerts
- Dual enclosure reporting monitors with failover control provides redundancy event monitoring security
- Auto detection of major components installed such as disk drives, fan/power supplies units, and RAID controllers are monitored by the EMU
- Embedded SAF-TE protocol interface for in-band enclosure (array) reporting capability
- Compact, low-profile VHDCI connectors on the host and drive I/O port modules for high density cable capability
- Dual redundant power supply/fan assemblies provide high availability (for example, can take inputs from separate power grids)
- AC power supplies feature load-sharing balancing and auto-ranging AC voltage input capability
- Four 52 CFM axial fans provide high availability redundancy and excellent cooling (two fans in each power supply FRU)
- Dynamic disk drive storage expansion within and across arrays
- Multi-host support, (up to two SCSI buses for host channels)
- Optional DC (-48/-60V) version for mobile and Telco installations
- NEBS Level 3; GR-63-CORE, GR-1089-CORE compliant

- Subset of MIL-STD-810F compliant
- Web browser launching of Sun StorEdge Configuration Service (Netscape™ 4.7+)
- Serial port out-of-band management and monitoring

Firmware Features

- Support for global spare disk drives, with applicable RAID level
- Simultaneous support of RAID levels 0, 1, 0+1, 3, 5, 3+0, and 5+0
- Support for non-disruptive dynamic firmware upgrades of the RAID controller (with redundant RAID controllers)
- RAID controller supports up to 128 SCSI LUNs
- RAID controller supports up to 256 command tag queues (CTQs)
- Random/sequential optimization for all logical drives (LDs)
- Write-back and write-through cache control
- In-band and out-of-band SAF-TE support for RAID controller drive arrays
- In-band SAF-TE support for expansion drive arrays
- Built-in SNMP traps and MIB support
- Built-in email generation for event reporting via Diagnostic Reporter
- Built-in terminal window line oriented menu

Host Interface

The host interface of the Sun StorEdge 3310 SCSI array is Ultra160 SCSI LVD, and can support a maximum of two direct attached hosts.

Input Power Options

- Dual-input load-sharing/load-balancing 100 to 240VAC universal input, load sharing
- Dual-input load-sharing/load- balancing -48VDC (-36VDC to .72VDC) or -60VDC input capabilities available

Power Supplies/Fans

The Sun StorEdge 3310 SCSI array has two fully redundant 420-Watt power supplies with load-sharing and load-balancing capabilities. Each AC power supply has auto-ranging capability from 90VAC to 264VAC and 47 to 63 Hz. With these redundant power supplies, one maintains electrical power to the system if the other fails.

A single power supply can spin up, maintain, and sustain power for a fully loaded Sun StorEdge 3310 SCSI array unit. Each power supply has an automatic thermal shutdown to prevent power supply damage from extreme heat environments.

DC output voltages have over-voltage protection, over current, and short circuit protection. Output current capacity is shown in the table below.

DC Output	Minimum Load	Maximum Load
+5 V	0 A	35 A
+12 V	250 mA	25 A

Both power supply units (PSUs) are removable canisters that slide into one of two slots in the back of the system. Each PSU canister has a locking handle, power status LED, AC power cord connector, and power switch.

Each power supply housing also contains two radial 52 CFM fan assemblies. Each fan is electrically isolated and powered by +12-volt common rail. This allows the fans to continue to run from the redundant power supply even though its power supply unit is turned off. Both 80mm axial fans are connected together in series to allow blade synchronization upon power on.

Power supplies can be replaced while the Sun StorEdge 3310 SCSI array controller and expansion arrays are in operation (hot-swappable).

Event Monitor Unit (EMU)

The event monitor unit (EMU) card monitors environmental information such temperature sensors, power supply status, and fan speed. The EMU has three microcontrollers to assist in managing and monitoring tasks:

- One microcontroller is dedicated for the ISEMS I2C protocol between the RAID controllers and the EMU board.
- Another microcontroller is dedicated to the control of the various LEDs.
- The primary microcontroller (Atmel 8515) communicates to both of the other microcontrollers (Atmel 2313). The 8515 microcontroller also monitors the fan speed status lines and the I2C interface from power supply / fan units. It also monitors the temperature sensors and communicates to the serial EEPROM on the drive mid-plane via I2C. The 8515 microcontroller handles the front panel LED and alarm switch control lines.

Additional features of the EMU include:

- Controls front and rear panel display LEDs and the buzzer (audible) alarm.
- Enclosures support dual fail-over EMU modules for fully redundant event monitoring safety.
- Monitors environmental conditions, including temperature, power supply status, and fan speeds.

- Monitors all internal +12v and +5v voltages for each power supply.

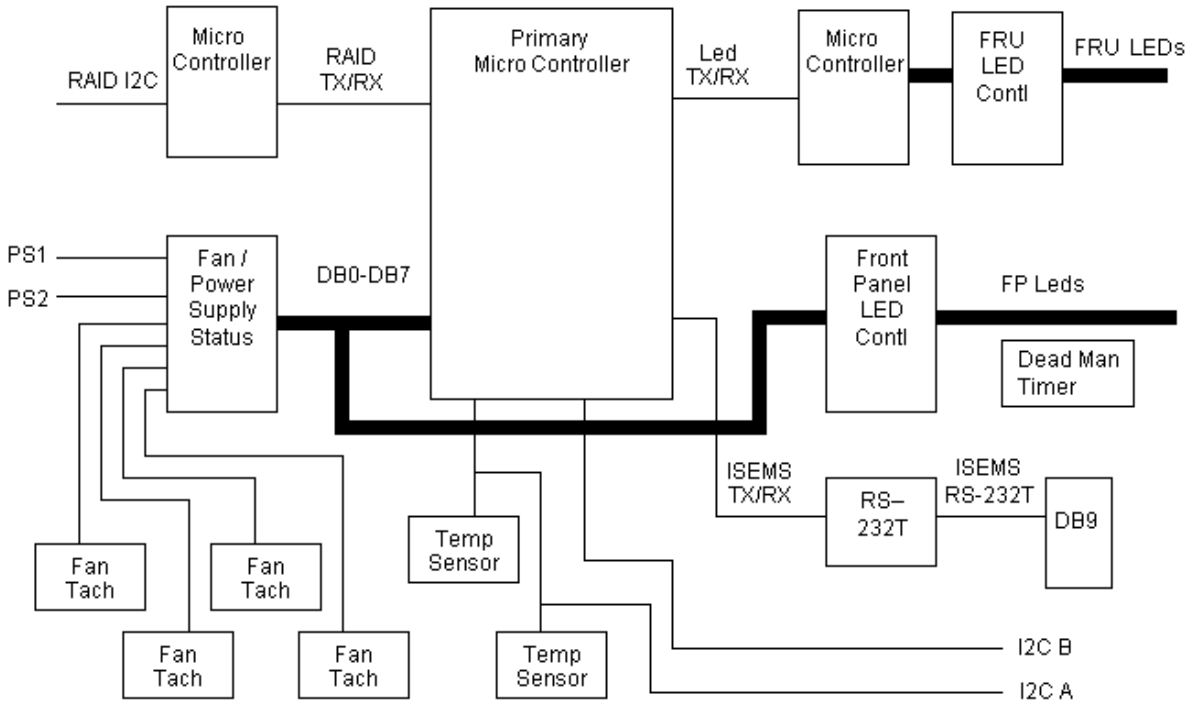

Figure 2. Event monitor unit (EMU) block diagram

Midplanes

Drive Midplane

The drive midplane is the main interconnect between the SCSI disk drives, RAID controller/midplane, and upper I/O board. The drive midplane has two separate SCSI buses. The internal buses can be independently configured as two 6-drive port channels or dependently configured as a single 12-drive channel by use of external rear panel jumper cables. There are no active components on the drive midplane.

RAID Midplane

The RAID midplane is the main interconnection between the RAID controllers, terminator board, EMU boards, and the two SCSI buses from the drive midplane. The RAID midplane also connects to the upper and lower I/O boards. There are no active components on the RAID midplane.

Connection Midplane

The connection midplane is the main interconnection between the upper I/O, lower I/O, and the two SCSI buses from the drive midplane. There are no active components on the connection midplane.

Upper and Lower I/O Boards (Single Module/FRU) (RAID)

The upper I/O has two independent output ports with auto termination for each SCSI bus. The lower I/O has two independent input ports for each SCSI bus. The two boards are contained in a single, hot-serviceable module.

The upper I/O card has three SCSI port connections (Ch 0, Ch 3, and single bus). Auto SCSI termination is available on Ch 0 and single bus connector ports.

The lower I/O card has three SCSI port connections (Ch 1, Ch 2, and dual bus).

The two boards are contained in a single module.

Terminator Board

The terminator board is a hot-serviceable, field-replaceable unit which supplies SCSI auto-termination for each of the four internal RAID channels.

RAID Controllers

Each 2U-high Sun StorEdge 3310 SCSI array can contain one or two Ultra160 SCSI LVD RAID controllers. Each RAID controller has four SCSI channels, two of which can be used as host channels, and 512 MB of battery-backed cache.

***Note**: Each RAID array can support a maximum of two host channels.*

An ASIC controller chip handles the interconnection between the CPU bus, DRAM memory, and PCI internal buses. It also handles the interface between the on-board flash, nvram, DB9 port chip, and 10/100 BASE-T Ethernet chip.

The RAID controllers can be configured as dual redundant active-to-active failover mode wherein they are hot-swap/redundant with mirrored synchronized-write cache. They can also be configured for dual-redundant active-passive mode.

Each RAID controller or RAID controller pair supports RAID 0, 1, 0+1, 3, 5, 3+0, and 5+0. Multiple RAID levels can be simultaneously supported.

Each RAID controller or RAID controller pair supports up to 128 LUNs and up to 256 command tag queues (CTQs).

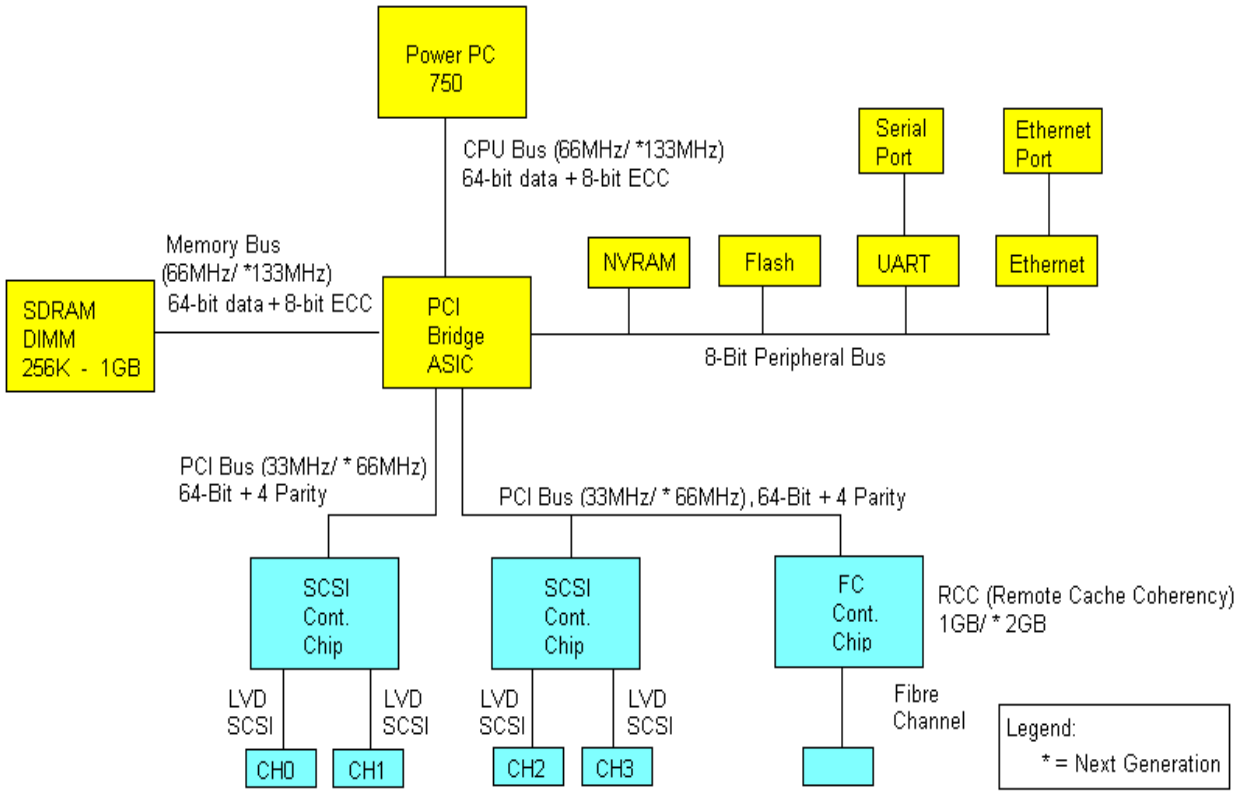

Figure 3. Sun StorEdge 3310 SCSI array RAID controller diagram

Each RAID controller has one 10/100 BASE-T Ethernet port for remote configuration, management, and monitoring and one DB9 serial port for local configuration, management, and monitoring.

Front Panel Indicators

This section describes the components accessed at the front of the Sun StorEdge 3310 SCSI array.

- Light indicators at the far right hand side of panel indicating (from top to bottom):
  - Power
  - Fan
  - Temperature
  - Event

Immediately below the Event LED is an audible-alert RESET pushbutton.

Behind the lockable front door are:

- Drive bays containing plug-in disk drives (drive sleds).
- Light indicators (LEDs) indicating drive status adjacent to each drive bay.

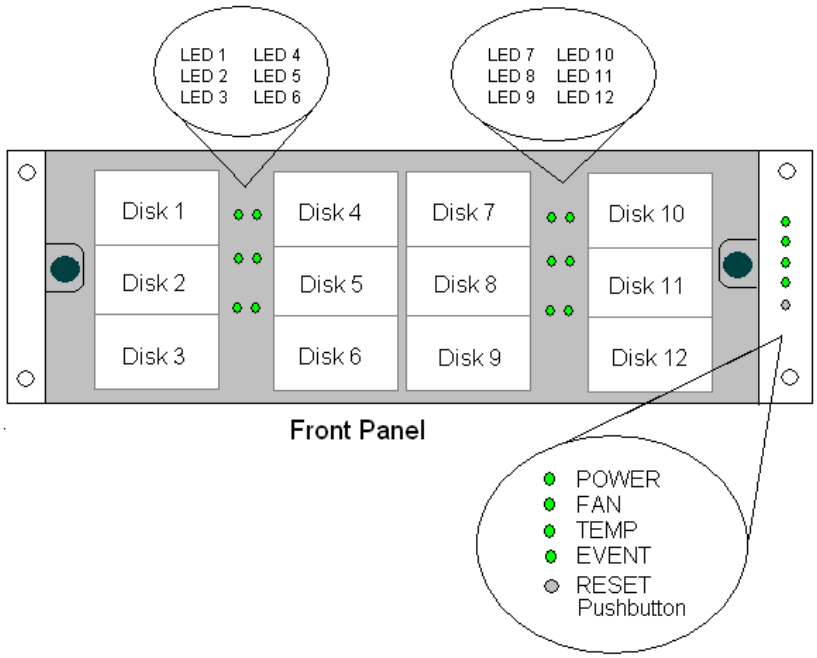

Figure 4. Front panel of the Sun StorEdge 3310 SCSI array

Rear Panel Indicators and Switches

These components are located on the back of the Sun StorEdge 3310 SCSI array:

- Four SCSI I/O connectors for connection to host or expansion array and two SCSI bus configuration connectors for selecting single-bus or split-bus configurations.
- One or two EMUs (labeled Event Monitor). If only one EMU is used, the EMU is in position 1, and a filler panel is inserted on the right (in position 2).
- One or two plug-in RAID controller modules which include one LAN and one serial RS-232 serial connections on each module.
- Two plug-in power supply canisters with integrated fan canisters.

With the exception of the drive sled connectors inside the Sun StorEdge chassis, the following connectors are located on the modules of the rear panel of the unit.

***Note**: Sun StorEdge 3310 SCSI array can support EITHER AC or DC power options.*

Connector Type	Location
Ethernet RJ-45 10BASE-T connector	RAID controller module
DB9 serial connector	RAID controller module
68-pin VHDCI connector	I/O module
AC power outlet, 420W	Power and fan module
DC power outlet	Power and fan module

Connector Type	Location
80-pin SCA connector	Midplane, connecting to drive sleds

The figures below display the port connections and LEDs for the rear panel components. SB or DB icons indicate where cables connect for single or dual bus.

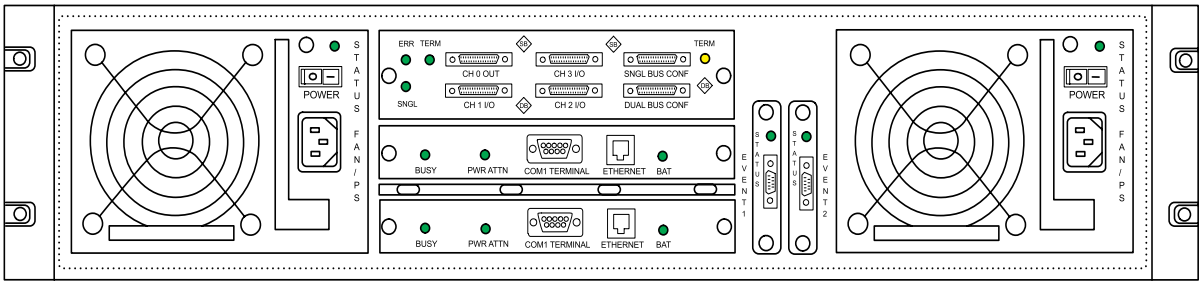

Figure 5. Rear panel, Sun StorEdge 3310 SCSI array (Dual RAID controller version)

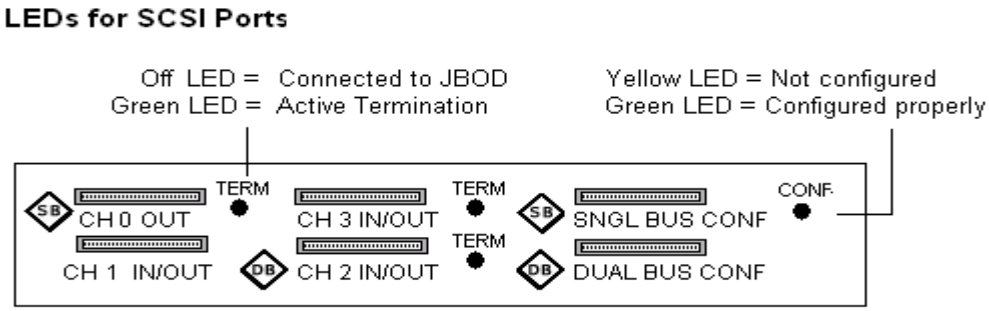

Figure 6. LEDs for SCSI ports

Support and Configuration (What Works with What)

Sun Solaris™ Operating Environment Host Platform Support Matrix

At the initial release, the Sun StorEdge™ 3310 SCSI arrays support Solaris™ Operating Environment versions 8 and 9 on the Sun platforms listed below.

Processor/System	RAID Array (single or dual controller)	JBOD/Expansion Array
Sun Enterprise™ 220R/420R servers	data/boot	data/boot
Sun Enterprise 250/450 servers	data/boot	data/boot
Sun Fire™ 280R server	data/boot	data/boot
Sun Fire 480R server	data/boot	data/boot
Sun Fire V880 server	data/boot	data/boot
Netra™ 20 server	data/boot	data/boot
Sun Fire V120/Netra 120 servers	data/boot	data/boot
Netra t 1400/1405 servers	data/boot	data/boot
Sun Blade™ 1000/2000 workstation	data	data

Note: *For details on how to boot off of the Sun StorEdge 3310 SCSI arrays in a Solaris Operating Environment, refer to the Bootability Details section of this document.*

Non-Solaris Operating Environment Host Platform Support Matrix

Processor/System	RAID Array (single or dual controller)	JBOD/ Expansion Array	Host HBA
Intel x86 architecture and Microsoft Windows NT 4.0 and Microsoft Windows 2000 Server Operating System	data	data	Adaptec 39160 dual channel Ultra160 LVD PCI HBA
Sun Linux 5.0 – on Sun LX50 server	data	data	Embedded SCSI controller
Linux – Red Hat distribution v 7.3	data	data	Adaptec 39160 dual channel Ultra160 LVD PCI HBA

Note 1: *The host HBA listed (Adaptec 39160 dual channel Ultra160 LVD PCI HBA) for Non-Solaris Operating Environment host platform support is NOT provided by Sun Microsystems.*

Note 2: *Sun Enterprise Services will honor the Sun StorEdge product warranty and provide break/fix service for Sun StorEdge 3310 SCSI arrays attached to the non-Solaris Operating Environment platforms listed above.*

Peripherals and Software Support Matrix

The following products are supported on the Sun StorEdge 3310 SCSI array at general availability. Additional hardware and software products are scheduled for support in subsequent releases.

Category	Description
SCSI Disk Drive	36-GB, 10000-rpm, Ultra 160 LVD SCSI, includes drive carrier Part number: XTA-3310-36GB-10K
Secondary RAID Controller	Ultra160 SCSI Hardware RAID Controller, 512 MB, and battery backup unit Part number: XTA-3310-Ctrl-512M
SCSI HBA	1) Dual-channel Ultra160 PCI – Please note that NO cables are included in this X option kit. Part number: X6758A 2) Applicable embedded SCSI controllers off of supported Solaris Operating Environment servers, Sun Linux 5.0 servers
Optional Power Supply	DC power supply (hot-swap) Part number: XTA-3310-DC-Kit
Back-up Software	VERITAS NetBackup
File System Software	VERITAS VxFS
Volume Manager Software	Sun Logical Volume Manager, VERITAS Volume Manager (VxVM including DMP)
Clustering Software	Sun™ Cluster 3.0 software

Note 1: *The Sun StorEdge 3310 SCSI RAID arrays do not come with any SCSI cables (for host/expansion units). Customers can order these according to their cabling needs. Only the JBOD/Expansion unit comes with one external SCSI cable.*

Note 2: *The secondary RAID controller option is only supported on arrays that have a primary RAID controller installed. JBOD/Expansion Sun StorEdge 3310 SCSI arrays CANNOT be converted into RAID arrays.*

Mounting Options

The Sun StorEdge 3310 SCSI array comes in tabletop or rack ready configurations for Sun racks, including the Sun StorEdge expansion rack and the Sun Fire rack. Kits are available for additional rack configurations.

***Note:** Rack-ready configurations of the Sun StorEdge 3310 SCSI array do **NOT** come with any rack mount rail kits. Customers need to order one of the following, depending on their needs:*

- XTA-3310-RK-19S – Rack kit, 2U 19-inch cabinet 22 to 28-inch
- XTA-3310-RK-19L – Rack kit, 2U 19-inch cabinet 28 to 36-inch
- XTA-3310-RK-19C – Rack kit, 2U 19-inch cabinet Telco center mount
- XTA-3310-RK-19F – Rack kit, 2U 19-inch cabinet Telco front mount

Expandability

The Sun StorEdge 3310 SCSI array can be expanded up to 36 drives (two expansion drive arrays and one RAID array array). All models support 12 disk drives per array.

Supported Configurations

Single or split-bus (dual-bus) configurations for Sun StorEdge 3310 SCSI arrays are field configurable through the use of rear panel jumper cable. In split-bus configurations, the drive midplane control signals are partitioned into two separate groups of six drives each. Separate SCSI control channels control each group within a drive array. A Sun StorEdge 3310 SCSI array drive array is available with zero, one, or two hardware RAID controllers. These configurations are discussed in more detail below.

Number of RAID Controllers	Maximum Host (servers) Supported from RAID Array	Single or Dual Bus Midplane (on RAID Array)	Maximum JBOD/Expansion Arrays Supported from RAID Array	Total Number of Drives Supported from RAID Array
One or Two	One	Dual	Two	36
One or Two	One	Single	Two	36
One or Two	Two	Dual	One	24
One or Two	Two	Single	One	24

Note: *JBOD arrays (arrays without RAID controllers) CANNOT be daisy-chained together.*

Connecting Cables for a Single Bus Configuration

A single bus configuration assigns all disk drive IDs in a drive array to one channel. This configuration is convenient administratively so the user can assign all RAID controller drive array drive IDs to Channel 0, and assigns all expansion array drive IDs to Channel 2.

- **To configure a RAID controller drive array** as a single bus configuration, connect the SCSI jumper cable between the SCSI ports labeled "CH 0 OUT" and "SINGLE BUS CONF" as shown in the figure below.

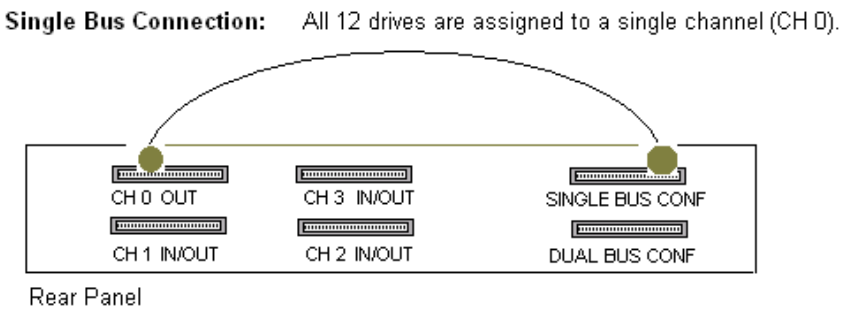

Figure 7. Single-bus cabling on a RAID controller drive array

- **To configure an expansion drive array** as a single bus configuration, connect the SCSI jumper cable between SCSI ports labeled between "SCSI A OUT" and "SCSI B IN."

Caution: *There is a limitation of 14 drive IDs per channel. Therefore, do NOT connect a dual bus Channel 0 or Channel 2 (6 IDs) to a single bus expansion drive array (12 IDs).*

- (Optional) Use a SCSI cable to connect a RAID controller drive array (Channel 2 port) to an expansion drive array (SCSI IN port). An example configuration would include a RAID controller drive array with all its drive IDs assigned to Channel 0, and an expansion drive array with all its drive IDs assigned to Channel 2.
- The default drive IDs for a single-bus configuration are shown in the figure below. ID6 and ID7 are reserved for controller communication and not used for drive IDs.

  The IDs are also displayed on the bottom inside edge of the chassis. These IDs are automatically assigned and appear in RAID controller status tables.

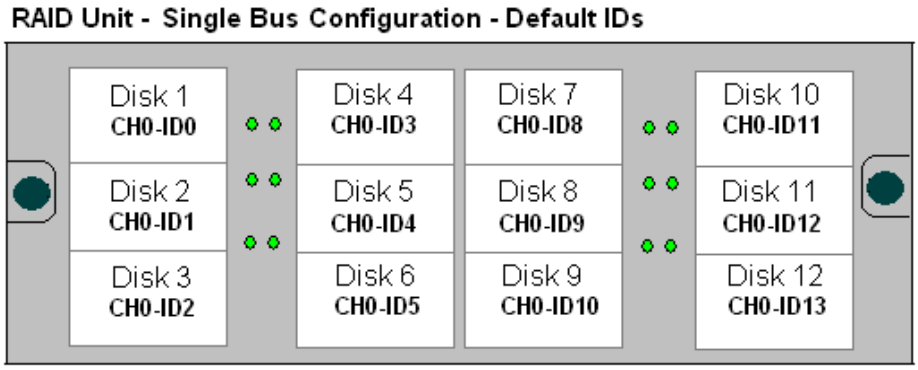

Figure 8. Default ID assignments, single bus RAID controller drive array

- Connect the RAID controller drive array (SCSI Channel 1 and 3 ports) to two host servers with HBA adapter cables. SCSI ports for Channels 1 and 3 are assigned as host channels by default.

Note: *Users can also reconfigure Channel 1 or Channel 3 to a drive channel status.*

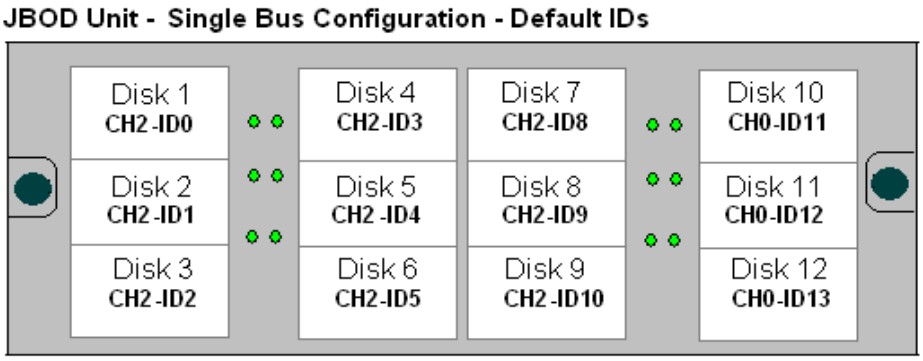

Figure 9. Default ID assignments, single-bus expansion drive array

Connecting Cables for a Dual Bus Configuration

A dual bus configuration assigns half of the disk drives and their IDs to one channel, and the other half of the disk drives and IDs to the second channel. This configuration is popular if the customer wants to use one set of drives to mirror the second set of drives with drives configured as RAID 1 drives.

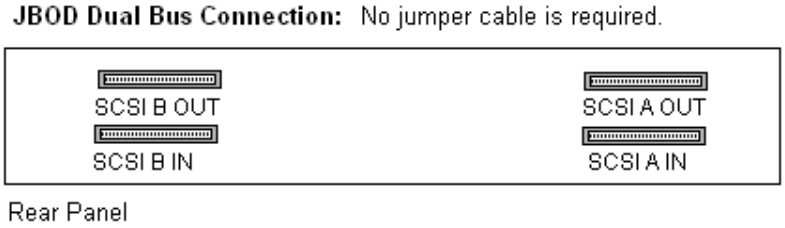

Figure 10. Expansion drive array dual-bus connection

- (Optional) Use a SCSI cable to connect a RAID controller drive array (Channel 2 port) to an expansion drive array (SCSI IN port).

Caution: *There is a limitation of 14 drive IDs per channel. Therefore, do NOT connect a dual bus Channel 0 or Channel 2 (6 IDs) to a single bus expansion drive array (12 IDs).*

The dual bus configuration below assigns half the IDs from the RAID controller and expansion drive arrays to Channel 0, and the other half of all the IDs to Channel 2. **The "SINGLE BUS CONF" port is a Channel 2 expansion port** in a dual bus configuration.

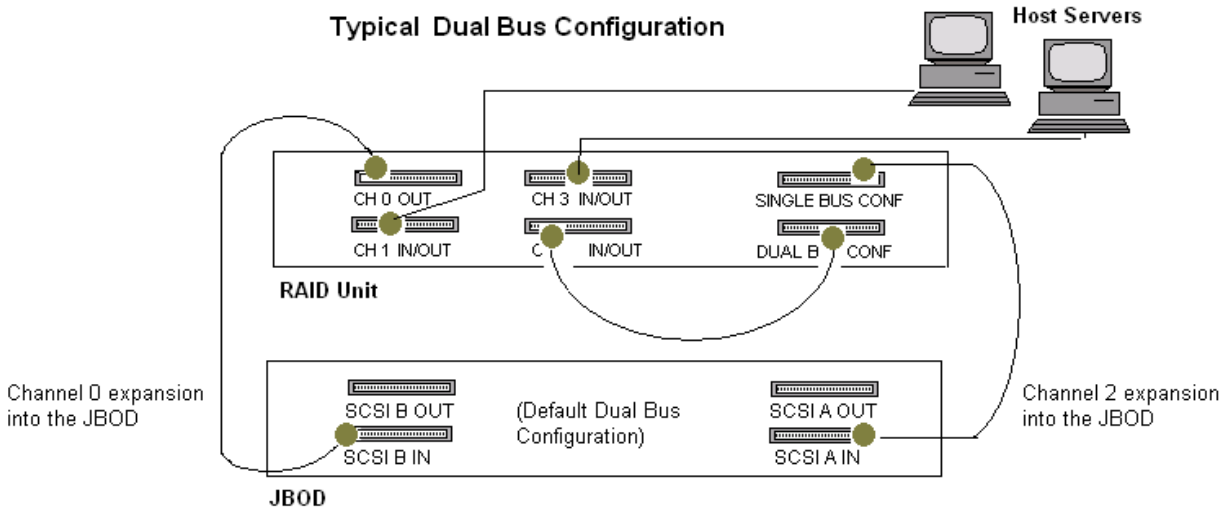

Figure 11. Dual-bus configuration

- Based on the configuration shown above, the default drive IDs for a dual bus configuration are shown in the figure below. ID6 and ID7 are reserved for controller communication and not used for drive Ids.
- The IDs are also displayed on the bottom inside edge of the chassis. These IDs are automatically assigned and appear in RAID controller status tables.
- Connect the RAID controller drive array (SCSI Channel 1 and 3 ports) to two host servers with HBA adapter cables. SCSI ports for Channels 1 and 3 are assigned as host channels by default.

Note: *To use Channel 1 or Channel 3 as a drive channel (which the user can connect to another expansion drive array), reconfigure the channel to a drive channel status.*

Alternative Configurations with Two Expansion Drive arrays

Designed for a redundant configuration, a standard RAID controller drive array has Channels 0 and 2 assigned as drive channels, and Channels 1 and 3 assigned as host channels.

Users can attach two expansion drive arrays to a RAID controller drive array if they change the host channel mode of Channel 1 or Channel 3 to a drive channel mode.

Caution: *There is a limitation of 14 drive IDs per channel. Therefore, do NOT connect a dual bus Channel 0 or Channel 2 (6 IDs) to a single bus expansion drive array (12 IDs).*

Connecting COM Port to a VT100 Terminal or Workstation

For a first-time configuration, users must assign an IP address to the chassis via the COM port of either controller module. Users can configure the RAID controller drive array via the COM port, or via the Ethernet port after they set up the IP address.

When users configure the RAID controller drive array for the first time, it automatically configures the primary controller and transfers the same configuration to the secondary controller.

Connecting Ethernet Port to LAN/WAN

To connect a RAID controller drive array to an Ethernet port, users must first assign an IP address to the RAID controller drive array via the Sun 2U COM port and a VT100 terminal or workstation.

Connect the Ethernet port of one of the controllers to the LAN connection. This connection enables configuration and monitoring of RAID controller and expansion drive arrays remotely.

Note: In a dual controller configuration, the Ethernet ports on both controllers must be connected in order to fully manage the array when one controller fails.

Connecting Event Monitor Unit (EMU) to an Expansion Drive Array

The EMU modules report fan, temperature, and voltage conditions to the controller which reports the events in the event log, in status windows and via alarms.

Reliability, Availability, and Serviceability (RAS)

The Sun StorEdge™ 3310 SCSI array includes the reliability, availability, and serviceability features listed below.

Reliability

The Mean Time Between System Outage (MTBS) of the Sun StorEdge 3310 SCSI array is specified to be greater than 330,000 hours. MTBF was calculated according to Telcordia SR-332 Issue 1, May 2001. Ambient temperature for the MTBF was calculated at 25 degrees C.

- The MTBF of a single controller/single-bus/12-drive Sun StorEdge 3310 SCSI array configuration is specified to be greater than 36,000 hours.
- The MTBF of a single controller/single-bus/9-drive Sun StorEdge 3310 SCSI array configuration is specified to be to be greater than 37,000 hours.
- The MTBF of a paired controller/single-bus Sun StorEdge 3310 SCSI array is specified to be greater than 34,000 hours.

The reliability features of the Sun StorEdge 3310 SCSI array include:

- NEBS Level 3 compliant
- MIL-STD-810F subset compliant
- Load-sharing/load-balancing extends power supply life

Availability

The availability features of the Sun StorEdge 3310 SCSI array include:

- Dual hot-swap/redundant load-sharing/load-balancing power supplies with separate inputs
- Hot-swap/redundant high-velocity (52 CFM) electrically isolated cooling fans are powered by a +12-volt common rail and contain detection circuitry to monitor degraded performance provide superior temperature control. Fans continue to run from the redundant power supply even though their power supply unit is turned off. The twin 80-mm axial fans in each PSU are connected together in series to allow blade synchronization upon power up.
- Hot-swap redundant event monitoring units
- Hot-swap redundant RAID controllers with mirrored synchronized-write cache (optional configuration)

Serviceability

Fail-over

The Sun StorEdge 3310 SCSI array supports both hard- and soft-failover capabilities.

- **Hard failover**

  The Sun StorEdge 3310 SCSI array automatically switches from the failed component to the redundant component.

- **Soft failover**

  The Sun StorEdge 3310 SCSI array provides the ability to manually failover a component for hardware upgrades, and so on.

Hot-Serviceability and Hot-Swappable FRUs

All hot-swap components can be replaced while the subsystem is on line and are automatically recognized by the subsystem. Additionally, the hot serviceable I/O card and terminator modules can be replaced while the system is powered on but off line.

Any single hot-swap field-replaceable unit (FRU) can be removed from the subsystem while running applications. All FRUs are easily accessible from the front or rear of the subsystem. Redundant hot-swappable or hot-serviceable FRUs include:

- RAID controllers/cache (when in paired mode)
- Disk drives (when part of a supported RAID configuration is selected)
- Event monitoring units (EMU)
- Power supply/cooling unit (PSU)
- I/O and SCSI termination modules (hot serviceable)
- Cache battery (hot serviceable)

Configuration and Management Software

There are three ways to configure and manage a Sun StorEdge™ 3310 SCSI array:

1. **Terminal menu interface** – This method allows the MOST control over the Sun StorEdge 3310 SCSI, since it "taps" directly into the array's RAID controller firmware.

Examples of the terminal menu interface are shown below.

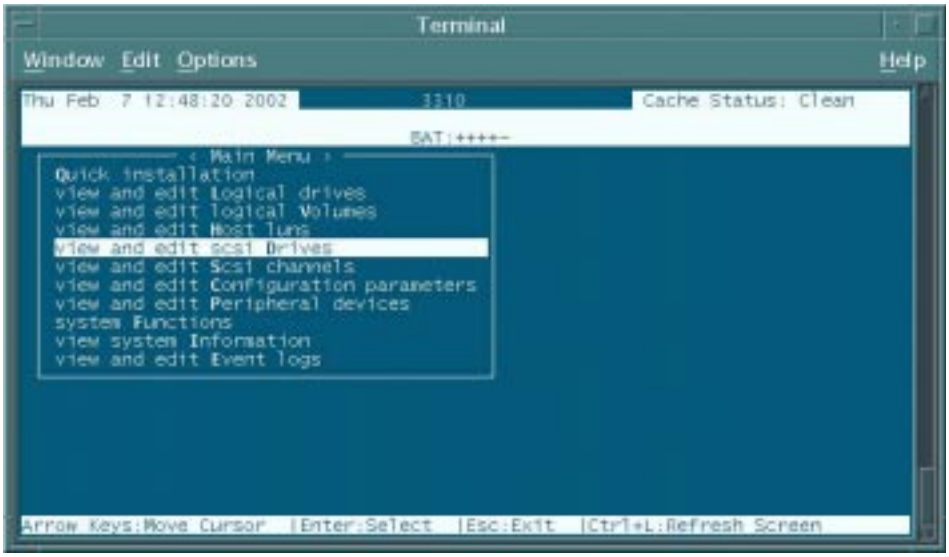

Figure 12. Terminal menu interface, main menu

Figure 13. Terminal menu interface, cache status

2. Sun StorEdge Configuration Service (SSCS) Graphical User Interface

A. This requires that an SSCS agent utility be loaded onto a Solaris™ Operating Environment server that is connected to a Sun StorEdge 3310 SCSI array that is to be managed/monitored.

B. An SSCS console utility also needs to be loaded onto a Solaris Operating Environment workstation.

C. From an SSCS console, the user can manage an X number of SSCS agents/Sun StorEdge 3310 SCSI arrays.

D. SSCS can also be used to dynamically change RAID controller firmware (when there are dual redundant controllers installed).

E. SSCS agent/console utilities for the Solaris Operating Environment are included in the Sun StorEdge 3310 SCSI software CD shipping package.

F. More details about SSCS are found in the sections below.

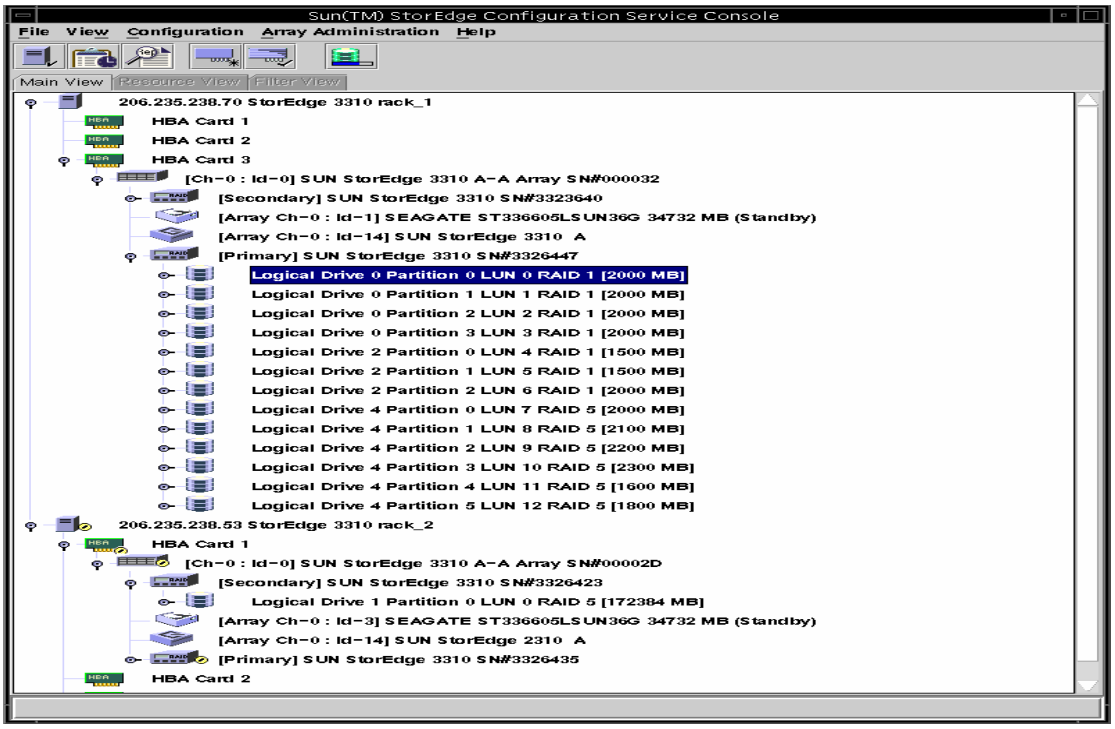
Sun(TM) StorEdge Configuration Service Console
File View Configuration Array Administration Help
Main View Resource View Filter View
206.235.238.70 StorEdge 3310 rack_1
HBA Card 1
HBA Card 2
HBA Card 3
[Ch-0 : Id-0] SUN StorEdge 3310 A-A Array SN#000032
[Secondary] SUN StorEdge 3310 SN#3323640
[Array Ch-0 : Id-1] SEAGATE ST336605LSUN36G 34732 MB (Standby)
[Array Ch-0 : Id-14] SUN StorEdge 3310 A
[Primary] SUN StorEdge 3310 SN#3326447
Logical Drive 0 Partition 0 LUN 0 RAID 1 [2000 MB]
Logical Drive 0 Partition 1 LUN 1 RAID 1 [2000 MB]
Logical Drive 0 Partition 2 LUN 2 RAID 1 [2000 MB]
Logical Drive 0 Partition 3 LUN 3 RAID 1 [2000 MB]
Logical Drive 2 Partition 0 LUN 4 RAID 1 [1500 MB]
Logical Drive 2 Partition 1 LUN 5 RAID 1 [1500 MB]
Logical Drive 2 Partition 2 LUN 6 RAID 1 [2000 MB]
Logical Drive 4 Partition 0 LUN 7 RAID 5 [2000 MB]
Logical Drive 4 Partition 1 LUN 8 RAID 5 [2100 MB]
Logical Drive 4 Partition 2 LUN 9 RAID 5 [2200 MB]
Logical Drive 4 Partition 3 LUN 10 RAID 5 [2300 MB]
Logical Drive 4 Partition 4 LUN 11 RAID 5 [1600 MB]
Logical Drive 4 Partition 5 LUN 12 RAID 5 [1800 MB]
206.235.238.53 StorEdge 3310 rack_2
HBA Card 1
[Ch-0 : Id-0] SUN StorEdge 3310 A-A Array SN#00002D
[Secondary] SUN StorEdge 3310 SN#3326423
Logical Drive 1 Partition 0 LUN 0 RAID 5 [172384 MB]
[Array Ch-0 : Id-3] SEAGATE ST336605LSUN36G 34732 MB (Standby)
[Array Ch-0 : Id-14] SUN StorEdge 2310 A
[Primary] SUN StorEdge 3310 SN#3326435
HBA Card 2

Figure 14. Sun StorEdge Configuration Service GUI

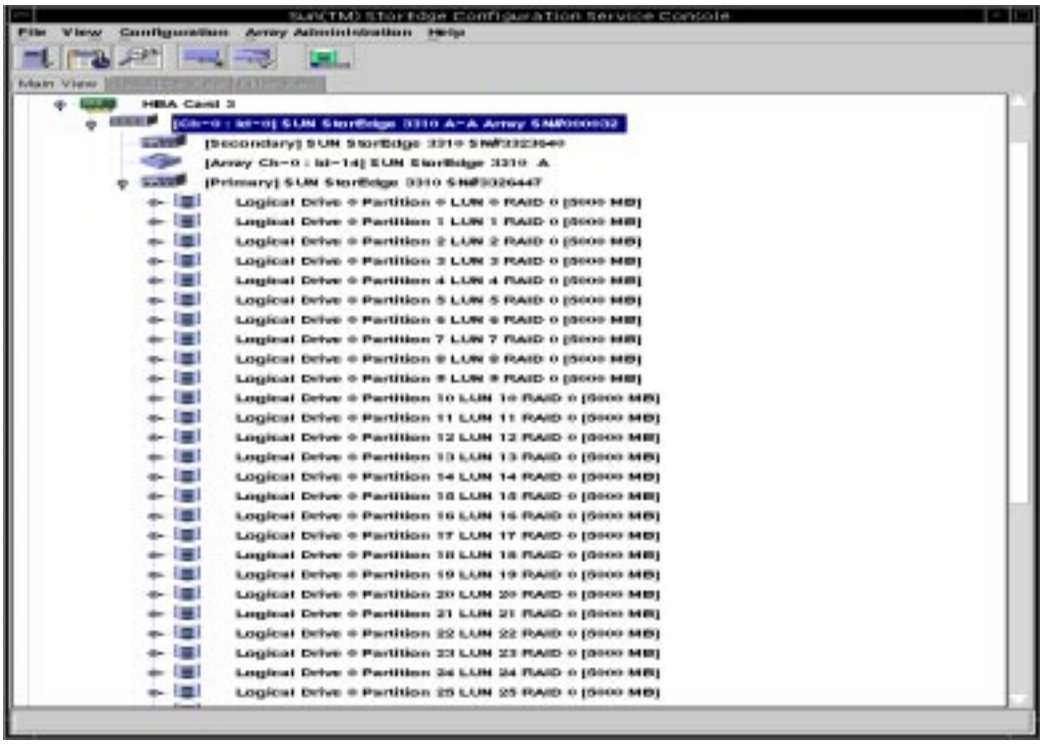
File View Configuration Array Administration Help
Main View
HBA Card 3
[Secondary] SUN StorEdge 3310 SN#3323649
[Array Ch=0 : Id=14] SUN StorEdge 3310 A
[Primary] SUN StorEdge 3310 SN#3326447
Logical Drive 0 Partition 0 LUN 0 RAID 0 [5000 MB]
Logical Drive 0 Partition 1 LUN 1 RAID 0 [5000 MB]
Logical Drive 0 Partition 2 LUN 2 RAID 0 [5000 MB]
Logical Drive 0 Partition 3 LUN 3 RAID 0 [5000 MB]
Logical Drive 0 Partition 4 LUN 4 RAID 0 [5000 MB]
Logical Drive 0 Partition 5 LUN 5 RAID 0 [5000 MB]
Logical Drive 0 Partition 6 LUN 6 RAID 0 [5000 MB]
Logical Drive 0 Partition 7 LUN 7 RAID 0 [5000 MB]
Logical Drive 0 Partition 8 LUN 8 RAID 0 [5000 MB]
Logical Drive 0 Partition 9 LUN 9 RAID 0 [5000 MB]
Logical Drive 0 Partition 10 LUN 10 RAID 0 [5000 MB]
Logical Drive 0 Partition 11 LUN 11 RAID 0 [5000 MB]
Logical Drive 0 Partition 12 LUN 12 RAID 0 [5000 MB]
Logical Drive 0 Partition 13 LUN 13 RAID 0 [5000 MB]
Logical Drive 0 Partition 14 LUN 14 RAID 0 [5000 MB]
Logical Drive 0 Partition 15 LUN 15 RAID 0 [5000 MB]
Logical Drive 0 Partition 16 LUN 16 RAID 0 [5000 MB]
Logical Drive 0 Partition 17 LUN 17 RAID 0 [5000 MB]
Logical Drive 0 Partition 18 LUN 18 RAID 0 [5000 MB]
Logical Drive 0 Partition 19 LUN 19 RAID 0 [5000 MB]
Logical Drive 0 Partition 20 LUN 20 RAID 0 [5000 MB]
Logical Drive 0 Partition 21 LUN 21 RAID 0 [5000 MB]
Logical Drive 0 Partition 22 LUN 22 RAID 0 [5000 MB]
Logical Drive 0 Partition 23 LUN 23 RAID 0 [5000 MB]
Logical Drive 0 Partition 24 LUN 24 RAID 0 [5000 MB]
Logical Drive 0 Partition 25 LUN 25 RAID 0 [5000 MB]

Figure 15. Sun StorEdge Configuration Service GUI

3. **Web Browser** – This method allows SSCS to be launched from a web browser (Netscape™ 4.7+). The functionality is the same as SSCS itself.

Sun StorEdge(tm) Configuration Service console – Netscape 6
File Edit View Search Go Bookmarks Tasks Help
Back Forward Reload Stop
file:///opt/SUNWsscs/sscsconsole/Console.html
Home Netscape Search Bookmarks Sun Internal Netscape ... SMI Management Alert...
Sun StorEdge(tm) Configuration Service console
Loading class sscsApplet

Figure 16. Sun StorEdge Configuration Service GUI, launched via web brower

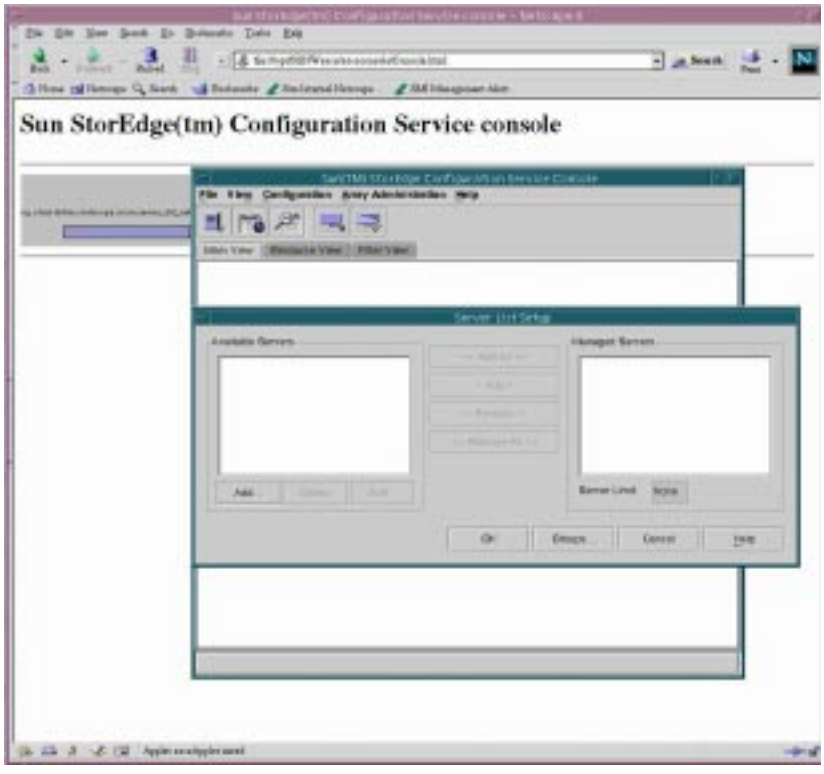

Figure 17. Sun StorEdge Configuration Service GUI, from web browser

Note 1: *The three methods discussed above can be used when the array is attached to a Solaris Operating Environment or Microsoft Windows 2000/NT-based server only.*

Note 2: *To configure a Sun Linux-based server or an X86/Linux-based server only method 1 (the terminal menu interface) is applicable.*

Sun StorEdge Configuration Service Software

Sun StorEdge Configuration Service software is a Java™ technology-based software program that combines storage configuration, maintenance, and monitoring tools into a single, easy-to-use application. Sun StorEdge Configuration Service software provides centralized administration of Sun StorEdge 3310 SCSI storage systems across existing local and wide area networks. It greatly simplifies storage management and reduces its administration costs.

The Sun StorEdge Configuration Service software graphical interface uses intuitive controls and graphics to present configuration options, maintenance features, and status information for storage systems and servers. A color-coded design provides feedback and clear status information for each component. Critical conditions that require immediate attention are always easily identified and simple to locate. Configuration features and controls are well marked and operate smoothly. Sun StorEdge Configuration Service software is also very easy to learn through its use of familiar interface elements.

Sun StorEdge Configuration Service software provides complete monitoring of Sun StorEdge 3310 specific RAID controllers, disk drives, etc. From a single Sun StorEdge Configuration Service console located anywhere on a network, system administrators can view entire Sun StorEdge 3310 storage systems, change storage configurations, and monitor storage status. In the event of a status change, Sun's Diagnostic Reporter software sends real-time, proactive alerts to the system administrator via its console display, e-mail, or through an alphanumeric pager, allowing users to monitor the storage system remotely.

Storage setup and management is easy with Sun StorEdge Configuration Service software. Custom configuration options allow network administrators to configure storage volumes, RAID levels, cache modes, stripe sizes, and other storage parameters to meet particular server and application requirements.

Sun StorEdge Configuration Service also allows dynamic array firmware upgrades when there are dual redundant controllers configured. With Sun StorEdge Configuration Service's unsurpassed ease of use and attention to detail, even the most ambitious storage installations are simple to manage.

Configuration services features include the following:

- GUI based management and monitoring
- Phone home alert support (email alerts)
  - Defines the types of message traps sent, the timing of messages sent, forward encrypted messages, and receive messages on the Diagnostic Reporter which functions as an email viewing program.
  - Operates in background mode continuously on the computer where it is installed and also has a controlling Sun StorEdge Configuration Service Agent (a controlling agent is the only agent which talks to a specific array).

RAID System Storage Resource Management Features

- Web-based 10/100 BASE-T Ethernet support
- Serial port out-of-band support

- RAID levels 0, 1, 0+1, 3, 5, 3+0, and 5+0
- Dynamic firmware upgrades (with redundant RAID controllers)
- Up to 128 LUNs and 256 CTQs per RAID controller
- 512-MB battery-backed ECC cache option per controller

Event Notification

- Dual hot-swap event monitoring units
- Notification of temperature, fan, and power supply status
- Each FRU has a status LED
  - Provides easy identification of FRU status
  - Automatic awareness of FRU installation
- Audible alarm

CLI Functionality

The command line interface (CLI) provides limited commands over the Sun StorEdge 3310 array. These commands are discussed in this section. The two most important functions of the CLI are: 1) the ability to download controller firmware (when the array is in dual controller mode); and 2) to download disk firmware.

Supported Command Modes

The CLI supports single command mode and prompting mode as shown in the following examples.

Type the entire command on the command line:

```
# sccli /dev/rdsk/c1t0d0s2 show events
```

Or specify the device on the command line:

```
# sccli /dev/rdsk/c1t0d0s2
sccli> show events
       :
sccli> quit
```

Or specify nothing on the command line:

```
# sccli
Available devices:
       1. /dev/rdsk/c1t0d0s2 [SUN StorEdge 3310 00028E]
       2. /dev/rdsk/c1t1d0s2 [SUN StorEdge 3310 00028F]
Enter selection: 1
sccli> show events
       :
sccli> quit
```

Accessing SCCLI Man Pages

To access the Man page for sccli without specifying environment variables, type

```
# man -M /opt/SUNWsscs/man sccli
```

To be able to type `man sccli` without specifying the man page directory each time, add the directory `/opt/SUNWsscs/man` to the colon-separated list of directories in the `$MANPATH` environment variable.

SCCLI Options and Subcommands

This section explains the device name, lists the options, and provides the available sccli subcommands along with sample code.

Note: *To prevent unauthorized access, the sccli requires super user or system administrator prvileges.*

Specifying the Device Name

Except for the `help` command, all sccli subcommands require the specification of a device filename, typically specified as:

```
/dev/rdsk/cXtYdZs2
```

where

X = controller number

Y = scsi target number

Z = logical unit number

`s2` = slice 2 of the (logical) disk. Usually, slice 2 is specified when identifying a disk for administrative purposes, but any slice number between 0 and 7 (if the slice exists) works.

Note: *If no device is specified on the command line, and more than one Sun StorEdge 3310 array is connected to the host, a menu of devices is presented with one device filename for each array. If there is only one StorEdge 3310 device connected to the host, that device is selected automatically.*

Options

```
-y, --yes
```

Assume a yes response to any yes/no prompts. This is used to allow particularly dangerous commands to be run from a script without prompting the user.

```
-n, --no
```

Assume a no response to any yes/no prompts.

```
-v, --version
```

Displays the version number of the sccli utility and exits without processing any subcommands.

```
-h, --help, --usage
```

Displays a usage message.

Options Usage

```
# sccli option device subcommand
```

Subcommands

Note: *If no subcommand is entered on the command line, sccli enters an interactive mode, prompting the user to enter subcommands until the quit command is entered. All subcommands operate on the currently-selected device.*

about

Displays version and copyright information.

```
# sccli device about
```

```
# sccli /dev/rdsk/c0t5d0s2 about
sccli version 1.0.2
Sun StorEdge 3000 Series command line interface
Copyright 2002 Dot Hill Systems Corporation
All rights reserved. Use is subject to license terms.
```

clear events

Clears the array's internal event log.

```
# sccli device clear events
```

```
# sccli /dev/rdsk/c0t5d0s2 clear events
```

Caution: *All download commands are potentially dangerous and should be used only as instructed.*

Note: *All download commands take the controller offline; therefore, after running a download command, the select command must be run to reselect the device.*

download controller-firmware

Downloads firmware into the controller. In a dual-controller configuration, the failover capability of the redundant controller pair is used to activate the new firmware without requiring the array to be shut down.

If boot-record is specified, it names an additional file that is downloaded at the same time.

```
# sccli device download controller-firmware filename [boot-record]
```

```
# sccli /dev/rdsk/c0t5d0s2 download controller-firmware SUN 325k-3310.bin
b32a131e
Start to download Boot record.... Done
Start to download controller firmware....Flashing and
Programming...
Done
Resetting Controller...Done
```

download disk-firmware

Downloads disk driver firmware into disk drives connected to the Sun StorEdge array. If a disk-model string is specified, it is matched against SCSI INQUIRY data to determine which drives should be programmed.

Note: To download firmware to expansion unit disk drives, they must be attached to the Sun StorEdge array. That is, the sccli utility does not download firmware to JBODs directly.

When using this command:

- All daemons that access the RAID controller must be stopped.
- I/O is interrupted.
- The controller is reset after disks are flashed.

Note: The option disk-model must be 16 characters. If it is less than 16 characters, a space must be inserted for each missing character up to 16 in between the quote marks. See the following code for an example.

```
# sccli device download disk-firmware filename disk-model
```

```
# sccli /dev/rdsk/c0t5d0s2 download disk-firmware st3366051.0538.fw
"ST336605LSUNS6G "
Controller is shutdown and entered into download mode
Start to send Disk Firmware data
Flashing firmware data, please wait...
Disk Firmware Download on Channel 0 Id 0 Completed
Disk Firmware Download on Channel 0 Id 1 Completed
Disk Firmware Download on Channel 0 Id 2 Completed
Disk Firmware Download on Channel 0 Id 3 Completed
Disk Firmware Download on Channel 0 Id 4 Completed
Disk Firmware Download on Channel 0 Id 5 Completed
Disk Firmware Download on Channel 0 Id 8 Completed
Disk Firmware Download on Channel 0 Id 9 Completed
Disk Firmware Download on Channel 0 Id 10 Completed
Disk Firmware Download on Channel 0 Id 11 Completed
Disk Firmware Download on Channel 0 Id 12 Completed
Disk Firmware Download on Channel 0 Id 13 Completed
Resetting controller...Done
```

download safte-firmware

Downloads firmware into the SAF-TE microprocessor in an LVD SCSI array enclosure controller.

When using this command:

- All daemons that access the RAID controller must be stopped.
- I/O is interrupted.
- The controller is reset after disks are flashed.

```
# sccli device download safte-firmware filename
```

```
# sccli /dev/rdsk/c0t5d0s2 download safte-firmware saftefw.bin
Controller is shut down and entered into download mode
Start to download firmware of SAFTE device modules
SAFTE Module EMU ENVIRONMENTAL Download on Channel 0 Id 14 OK!
SAFTE Module EMU ISEMS Download on Channel 0 Id 14 OK!
SAFTE Module EMU LED CONTROLLER Download on Channel 0 Id 14 OK!
SAFTE Module POWER SUPPLY CTRL Download on Channel 0 Id 14 OK!
SAFTE Module SAFTE HC11 Download on Channel 0 Id 14 OK!
Writing Safte FW Package 0.93 to target Channel 0 Id 14 OK!
Download SAFTE Firmware OK!
Safte Module Firmware Download on Channel 0 Id Completed
Resetting Controller...Done
```

help

Displays a short synopsis of available commands.

```
# sccli help
```

inquiry

Displays SCSI INQUIRY data returned by the array controller. (Shortcut for show inquiry-data).

```
# sccli device inquiry
```

```
# sccli /dev/rdsk/c0t5d0s2 inquiry
Vendor: SUN
Product: StorEdge 3310
Revision: 0325
Vendor-specific S/N: 5E034B32-00
Peripheral Device Type: 0
Removable Media: no
Page 80 Serial Number: 00028E5E034B3200
Page 83 Logical Unit Device ID: 600C0FF00000000000028E5E034B3200
```

Caution: *All reset commands are potentially dangerous and should be used only as instructed.*

reset controller

Resets the controller. This temporarily causes the array to go offline, which in turn may affect applications running on any hosts connected to the array. Also see shutdown controller.

```
# sccli device reset controller
```

```
# sccli /dev/rdsk/c0t5d0s2 reset controller
WARNING: This is a potentially dangerous operation. The controller
will go offline for several minutes. Data loss may occur if the
controller is currently in use.
Are you sure? no
```

reset nvram

Clears the NVRAM configuration memory and restores factory defaults. After issuing this command, a reset controller operation should be done, and the controller must be reconfigured to restore any non-default configuration options.

Caution: *Logical devices are not deleted, but it is possible for them to become inaccessible after this command is run. This may result in data loss.*

```
# sccli device reset nvram
```

select

Select a new device to which subsequent commands are issued. If no device is specified, and more than one choice exists, a menu of choices is displayed.

```
sccli> select device
```

```
sccli> select /dev/rdsk/c0t5d0s2
sccli: selecting /dev/rdsk/c0t5d0s2 [SUN StorEdge 3310 00028E]
```

show events

Displays the contents of the array's event log.

```
# sccli device show events
```

```
# sccli /dev/rdsk/c0t5d0s2 show events
Tue Jul 30 16:04:45 2002
[0181] Event Index 1 : "StorEdge Unit (SN 3150177) Controller
NOTICE: Controller Initialization Completed"
Tue Jul 30 16:04:24 2002
[0181] Event Index 2 : "StorEdge Unit (SN 3150177) Controller
NOTICE: Controller Initialization Completed"
```

show inquiry-data

Displays the SCSI INQUIRY data returned by the array controller.

```
# sccli device show inquiry-data
```

```
# sccli /dev/rdsk/c0t5d0s2 show inquiry-data
Vendor: SUN
Product: StorEdge 3310
Revision: 0325
Vendor-specific S/N: 5E034B32-00
Peripheral Device Type: 0
Removable Media: no
Page 80 Serial Number: 00028E5E034B3200
Page 83 Logical Unit Device ID: 600C0FF00000000000028E5E034B3200
```

shutdown controller

Shuts down the RAID controller and stops I/O processing. This temporarily causes the array to go offline, which in turn may affect applications running on any hosts connected to the array. Data in the controller cache is flashed to logical drives. After issuing this command, the user usually issues the reset controller command.

```
# sccli device shutdown controller
```

```
# sccli /dev/rdsk/c0t5d0s2 shutdown controller
WARNING: This is a potentially dangerous operation. The controller
will go offline for several minutes. Data loss may occur if the
controller is currently in use.
Are you sure? no
```

quit

Exits the interactive mode.

```
sccli> quit
```

Ordering Information

Ordering Notes

Note 1: *All Sun StorEdge™ 3310 SCSI array configurations ship with documentation and software CD. There is NO hard copy documentation, with the exception of release notes.*

Note 2: *All Sun StorEdge 3310 SCSI array configurations ship with dual redundant power supplies standard. Customers can order either AC or DC equipped versions.*

Note 3: *All Sun StorEdge 3310 SCSI array configurations ship with the nameplate "Sun StorEdge 3300" affixed on the front bezel.*

Note 4: *For 5-drive configurations of the Sun StorEdge 3310 SCSI array, 5 corresponding drive carriers are included installed with the drives in the array. The remaining seven empty drive bays do NOT come with empty drive carriers. Customers can purchase additional Sun StorEdge 3310 SCSI array specific X-option drives, which do come with drive carriers.*

Note 5: *The Sun StorEdge 3310 SCSI array drive carriers are UNIQUE – Sun StorEdge T3, A/D1000, D2, etc. drive carriers CANNOT be used in the Sun StorEdge 3310 SCSI array.*

Note 6: *All drive bays MUST be populated with either 1) a drive; or 2) an air management sled. This is critical to maintain proper air flow and cooling in the system.*

Note 7: *All Sun StorEdge 3310 SCSI array configurations ship with a cable that allows the array to be configured for single or dual SCSI bus operation.*

Note 8: *All Sun StorEdge 3310 SCSI array configurations (RAID controller equipped) ship pre-configured with RAID level 5, and a global standby hot-spare drive.*

Note 9: *Rack-ready configurations of the Sun StorEdge 3310 SCSI array do NOT come with any rack mount rail kits. Customers need to order one of the following, depending on their needs:*

- *XTA-3310-RK-19S – Rack kit, 2U 19-inch cabinet 22-28-inch*
- *XTA-3310-RK-19L – Rack kit, 2U 19-inch cabinet 28-36-inch*
- *XTA-3310-RK-19C – Rack kit, 2U 19-inch cabinet Telco center mount*
- *XTA-3310-RK-19F – Rack kit, 2U 19-inch cabinet Telco front mount*

Note 10: *All Sun StorEdge 3310 SCSI array pricing is listed under discount Category P.*

Part Number Format Description

The basic system configuration can be determined from the components of each part number. Here is an example part number, with each component explained.

Example part number = XTA3310T01A0R436

X = X-option

T = Sun StorEdge product designator

A = Revision level

3310 = Model number

T = Physical configuration: T = tabletop, R = rack ready

01 = Number of arrays in a rack

A = Power supply: A = AC, D = DC

0 = Number of controllers per array: 0 = JBOD/Expansion, 1 = 1 RAID controller, 2 = 2 RAID controllers

R = Drive size and rpm: R = 3.5-inch, 10000-rpm

436 = Capacity: 436 = 12 x 36-GB disks, 182 = 5 x 36-GB drives

Sun StorEdge 3310 SCSI Array – RAID Controller Drive array, AC Power Part Numbers

Part Number	Description
XTA3310T01A1R182	Sun StorEdge 3310 SCSI array, tabletop, 182 GB (5 x 36.4-GB 10000-rpm disks), with one Ultra160 SCSI LVD hardware RAID controller, 512-MB standard cache, two AC power supplies, and Sun StorEdge Configuration Service
XTA3310R01A1R182	Sun StorEdge 3310 SCSI array, rack ready, 182 GB (5 x 36.4-GB 10000-rpm disks) with one Ultra160 SCSI LVD hardware RAID controller, 512-MB standard cache, two AC power supplies, and Sun StorEdge Configuration Service
XTA3310T01A1R436	Sun StorEdge 3310 SCSI array, tabletop, 436 GB (12 x 36.4-GB 10000-rpm disks) with one Ultra160 SCSI LVD hardware RAID controller, 512-MB standard cache, two AC power supplies, and Sun StorEdge Configuration Service
XTA3310R01A1R436	Sun StorEdge 3310 SCSI array, rack ready, 436 GB (12 x 36.4-GB 10000-rpm disks) with one Ultra160 SCSI LVD hardware RAID controller, 512-MB standard cache, two AC power supplies, and Sun StorEdge Configuration Service

Part Number	Description
XTA3310T01A2R182	Sun StorEdge 3310 SCSI array, tabletop, 182 GB (5 x 36.4-GB 10000-rpm disks) with two Ultra160 SCSI LVD hardware RAID controllers, 512-MB standard cache per controller, two AC power supplies, and Sun StorEdge Configuration Service
XTA3310R01A2R182	Sun StorEdge 3310 SCSI array, rack ready, 182 GB (5 x 36.4-GB 10000-rpm disks) with two Ultra160 SCSI LVD hardware RAID controllers, 512-MB standard cache per controller, two AC power supplies, and Sun StorEdge Configuration Service
XTA3310T01A2R436	Sun StorEdge 3310 SCSI array, tabletop, 436 GB (12 x 36.4-GB 10000-rpm disks) with two Ultra160 SCSI LVD hardware RAID controllers, 512-MB standard cache per controller, two AC power supplies, and Sun StorEdge Configuration Service
XTA3310R01A2R436	Sun Sun StorEdge3310 SCSI array, rack ready, 436 GB (12 x 36.4-GB 10000-rpm disks) with two Ultra160 SCSI LVD hardware RAID controllers, 512-MB standard cache per controller, two AC power supplies, and Sun StorEdge Configuration Service

Sun StorEdge 3310 SCSI Array – JBOD/Expansion Drive array, AC Power Part Numbers

Part Number	Description
XTA3310T01A0R182	Sun StorEdge 3310 SCSI array, tabletop, 182 GB (5 x 36.4-GB 10000-rpm disks), Ultra160 SCSI LVD-JBOD, and two AC power supplies
XTA3310R01A0R182	Sun StorEdge 3310 SCSI array, rack ready, 182 GB (5 x 36.4-GB 10000-rpm disks), Ultra160 SCSI LVD-JBOD, and two AC power supplies
XTA3310T01A0R436	Sun StorEdge 3310 SCSI array, tabletop, 436 GB (12 x 36.4-GB 10000-rpm disks), Ultra160 SCSI LVD-JBOD, and two AC power supplies
XTA3310R01A0R436	Sun StorEdge 3310 SCSI array, rack ready, 436 GB (12 x 36.4-GB 10000-rpm disks), Ultra160 SCSI LVD JBOD/Expansion Drive array, and two AC power supplies

Sun StorEdge 3310 SCSI Array – RAID Controller/JBOD Expansion Drive array, DC Power Part Numbers

Part Number	Description
XTA3310R01D1R182	Sun StorEdge 3310 SCSI array, rack ready, 182 GB (5 x 36.4-GB 10000-rpm disks) with one Ultra160 SCSI LVD hardware RAID controller, 512-MB standard cache, two DC power supplies, and Sun StorEdge Configuration Service
XTA3310R01D1R436	Sun StorEdge 3310 SCSI array, rack ready, 436 GB (12 x 36.4-GB 10000-rpm disks) with one Ultra160 SCSI hardware RAID controller, 512-MB standard cache, two DC power supplies, and Sun StorEdge Configuration Service
XTA3310R01D2R182	Sun StorEdge 3310 SCSI array, rack ready, 182 GB (5 x 36.4-GB 10000-rpm disks) with two Ultra160 SCSI LVD hardware RAID controller, 512-MB standard cache per controller, two DC power supplies, and Sun StorEdge Configuration Service
XTA3310R01D2R436	Sun StorEdge 3310 SCSI array, rack ready, 436GB (12 x 36.4-GB 10000-rpm disks) with two Ultra160 SCSI hardware RAID controller, 512-MB standard cache per controller, two DC power supplies, and Sun StorEdge Configuration Service
XTA3310R01D0R182	Sun StorEdge 3310 SCSI array, rack ready, 182 GB (5 x 36.4-GB 10000-rpm disks) Ultra160 SCSI LVD JBOD/Expansion Drive array, and two DC power supplies

Cables

The total length of all SCSI cables on any one bus should not exceed 12 meters (point-to-point). The customer must order VHDCI cables if needed. Available cables are listed in the table below.

Note 1: *Both RAID and JBOD/Expansion units come equipped with one (1) external jumper cable that enables field configuration for single or split SCSI bus.*

Note 2: *The JBOD/Expansion units also come standard with one (1) VHDCI/VHDCI SCSI 1.5-foot cable, for connectivity to the RAID equipped array.*

Note 3: *The RAID unit also comes with a serial cable and Ethernet cable for manageability.*

Part Number	Description
X3831B	10-meter Ultra160 SCSI LVD cable, VHDCI/VHDCI
X3830B	4-meter Ultra160 SCSI LVD cable, VHDCI/VHDCI
X1138A	2-meter Ultra160 SCSI LVD cable, VHDCI/VHDCI
X1137A	1.2-meter Ultra160 SCSI LVD cable, VHDCI/VHDCI

Part Number	Description
X1136A	0.8-meter Ultra160 SCSI LVD cable, VHDCI/VHDCI

Options

The table below lists options available for the Sun StorEdge 3310 SCSI array.

Note: *The use of a SCSI terminator (part number XTA-3310-SC-TERM) is only needed when the following combination is implemented: JBOD/Split Bus/Dual host. All other configurations do NOT need external SCSI termination.*

Option Number	Description
XTA-3310-DC-Kit	DC power supply/fan module, 2U
XTA-3310-36GB-10K	Drive module, 36 GB LVD, 10000 rpm
XTA-3310-Ctrl-512M	RAID controller module, 512-MB memory, battery back up
XTA-3310-SC-TERM	SCSI terminator
X6758A	Dual-channel Ultra160 PCI host adapter
XTA-3310-RK-19S	Rack kit, 2U, 19-inch cabinet, 22 to 28 inches
XTA-3310-RK-19L	Rack kit, 2U, 19-inch cabinet, 28 to 36 inches
XTA-3310-RK-19C	Rack kit, 2U, 19-inch cabinet Telco center mount
XTA-3310-RK-19F	Rack kit, 2U, 19-inch cabinet Telco front mount

WEBDESK Ordering Flow Chart

The following is a text representation of WEBDESK's GUI order flow for the Sun StorEdge 3310 SCSI array. Please visit WEBDESK directly for the most updated flow structure.

There are three URLs, depending on the geography

- AMER = `http://webdesk.central`
- APAC = `http://webdesk.singapore`
- EMEA = `http://webdesk.holland`

STEP 1: Number of HW RAID Controllers

Select 0 JBOD/Expansion, 1, or 2.

STEP 2: Storage Location

Select Rack Ready or Table Top.

STEP 3: Power Type

Select AC or DC.

STEP 4: Disk Type

Select 36.4 GB 10k RPM Drive. More options to come at a later date.

STEP 5: Number of Disks per Array (total capacity)

Select any value from 5 to 12. 5-bay and 12-bay configurations come with drives factory installed. Selecting values 6, 7, 8, 9, 10, or 11 yield extra drives shipped as X-options (field configurable).

STEP 6: Number of External SCSI I/O Connections

Select 1 or 2. Selecting value 1 requires one cable; selecting 2 requires two cables. Cables are auto-inserted according to selected part number in Step 7.

STEP 7: Preferred Cable(s)

Select 1 and only 1 of the following cables. 1 or 2 are auto-inserted by the configurator. (Qty depends on selection in Step 6):

X3830B	4-meter cable SCSI, VHDCI/VHDCI
X3831B	10-meter SCSI VHDCI/VHDCI
X1138A	2-meter cable, SCSI, VHDCI/VHDCI
X1137A	1.2-meter cable, SCSI, VHDCI/VHDCI
X1136A	0.8-meter cable, SCSI, VHDCI/VHDCI

Note: *All Sun StorEdge 3310 arrays come equipped with an external jumper cable for field configuration of single or dual (split) bus. JBOD arrays come equipped with a second cable used for connectivity to a RAID unit.*

STEP 8: Number of Expansion Arrays (RAID controlled arrays only)

Select 0, 1, or 2 expansion arrays. 0 and 1 are always valid; 2 is only valid when 1 external SCSI I/O connection is selected.

Note: *"Storage Location" and "Power Type" for expansion arrays are identical to the RAID array configured. The user selects the Type and Number of disks. See Steps 9 and 10.*

STEP 9: Expansion Array Disk Type

Select 36.4 GB 10k RPM Drive. More options to come at a later date.

STEP 10: Number of Disks per Expansion Array (total capacity)

Select any value from 5 to 12. 5-bay and 12-bay configurations come with drives factory installed. Selecting values 6, 7, 8, 9, 10, or 11 yield extra drives shipped as X-options (field configurable).

STEP 11: Rackmount Kit (Rack-Ready Arrays only)

Select any of the following:

No Rackmount kit	
XTA-3310-RK-19S	19-inch rackmount kit for 22 to 28-inch cabinets
XTA-3310-RK-19L	19-inch rackmount kit for 28 to 36-inch cabinets
XTA-3310-RK-19C	19-inch rackmount kit for Telco cabinets, center mount
XTA-3310-RK-19F	19-inch rackmount kit for Telco cabinets, front mount

STEP 12: Add SCSI Terminator (JBOD arrays only)

Select (or leave de-selected) checkbox for SCSI terminator (XTA-3310-SC-TERM).

Note: *This part is only required when using a Sun StorEdge 3310 array in a dual host, split bus, JBOD configuration.*

STEP 13: Add Host Bus Adapter

When configuring a single server and Sun StorEdge 3310 array, select a minimum of one X6758A for every two external SCSI I/O connections required. If the user does not add sufficient X6758A options to meet this requirement, WEBDESK auto-inserts the required number of X6758A parts.

When configuring "Standalone Storage," the user has several choices:

1. Select "Add default HBAs." The configurator adds one X6758A for every two external SCSI I/O connections required.
2. Select "Add custom HBAs." The configurator does not add any HBAs and the user has the option of selecting any type and Qty of HBAs that they would like (This configuration is NOT validated
3. Select "No HBAs Required." The configurator does not add any HBAs.

Note: *Only X6758A is valid. Co-existence of a Sun StorEdge 3310 array and any other storage device on the same host bus adapter is not allowed.*

Configuration Guide

This section provides a summary of the configurations available for the Sun StorEdge 3310 SCSI array.

Feature	Sun StorEdge 3310 SCSI Array Specifications
Product Description	One Ultra160 SCSI External Storage array
Operating System Support	• Solaris 8/9 Operating Environment • Microsoft Windows NT and 2000 • Sun Linux 5.0 (on LX50 server) • Red Hat Linux rev. 7.3
Disk Capacity/Types	Ultra160 SCSI LVD 36-GB, 10000-rpm, 1-inch high (low-profile)

Feature	Sun StorEdge 3310 SCSI Array Specifications
Number of Disks	• 12 per drive array • 5 drive or 12 drive configurations • 96 per 72-inch Sun StorEdge cabinet (8 arrays)
Max. Raw Capacity	432 GB per drive array (12x36 GB)
Host Interface	Ultra160 SCSI LVD
Hardware-based RAID Controller Support	• One RAID controller per drive array • Two RAID controllers per drive array
Software-based RAID Support	• Solstice DiskSuite™ 4.1 or greater • VERITAS Volume Manager 3.2 or greater
Cluster Support	Sun Cluster 3.0 software
Max. Number of Interfaces per RAID Controller	Four Ultra160 SCSI LVD ports
Dimension	• Tabletop = H 3.6" x W 19" x D 18" (main chassis) • Rack ready = H 3.5" x W 17.6" x D 18" (main chassis)
Footprint	2U high rackmount or as tabletop
Power Supplies	Two hot-swap/redundant , AC or DC option
Warranty	2-year: First year – Second business day on-site Second year – 15-day parts exchange
Host Bus Adapter Options	X6758A = PCI Ultra160SCSI host adapter
Cable Options	Ultra160 SCSI LVD cables, VHDCI/VHDCI • X3831B = 10-meter cable • X3830B = 4-meter cable • X1138A = 2-meter cable • X1137A = 1.2-meter cable • X1136A = 0.8-meter cable

Frequently Asked Questions

This section summarizes some of the most frequently asked questions for the Sun StorEdge™ 3310 array. Additional details can be found throughout this JTF document.

Question 1. What does the Sun StorEdge 3310 SCSI array ship with?

A. Aside from the associated configuration specific components, (# of HDDs, # of controllers, etc.) here are some important notes regarding the Sun StorEdge 3310 SCSI array:

Note 1:	*All Sun StorEdge 3310 SCSI array configurations ship with documentation on a CD. There is NO hard copy documentation.*
Note 2:	*All Sun StorEdge 3310 SCSI array configurations ship with dual redundant power supplies standard. Customers can order either AC or DC equipped versions.*
Note 3:	*All Sun StorEdge 3310 SCSI array configurations ship with the nameplate "Sun StorEdge 3300" affixed on the front bezel.*
Note 4:	*For 5-drive configurations of the Sun StorEdge 3310 SCSI array, 5 corresponding drive carriers are included installed with the drives in the array. The remaining seven empty drive bays do NOT come with empty drive carriers. These empty drive bays are populated with air management sleds. Customers can purchase additional Sun StorEdge 3310 SCSI array specific X option drives, which do come with drive carriers.*
Note 5:	*The Sun StorEdge 3310 SCSI array drive carriers are UNIQUE. The drive carriers for other storage products (T3, A/D1000, D2, etc.) CANNOT be used in the Sun StorEdge 3310 SCSI array.*
Note 6:	*All Sun StorEdge 3310 SCSI array configurations ship with a cable that enables the array to be configured for single or dual SCSI bus operation.*
Note 7:	*All Sun StorEdge 3310 SCSI array configurations (RAID controller equipped) ship pre-configured with RAID level 5, and a global standby hot-spare drive.*

Question 2. Do the rack-ready configurations come with rackmount rail-kits?

A. Rack-ready configurations of the Sun StorEdge 3310 SCSI array do NOT come with any rack mount rail kits. Customers need to order one of the following, depending on their needs:

- XTA-3310-RK-19S - Rack kit, 2U 19-inch cabinet 22 to 28-inch
- XTA-3310-RK-19L - Rack kit, 2U 19-inch cabinet 28 to 36-inch
- XTA-3310-RK-19C - Rack kit, 2U 19-inch cabinet Telco, center mount
- XTA-3310-RK-19F - Rack kit, 2U 19-inch cabinet Telco, front mount

Question 3. How many host or JBOD connections are supported for a single or split bus configuration?

A. Four configurations are supported in either single or split bus configurations. All configurations support one or two RAID controllers.

1. Split Bus - 2 JBOD - 1 Host - 36 drives total
2. Single Bus - 2 JBOD - 1 Host - 36 drives total
3. Split Bus - 1 JBOD - 2 Hosts - 24 drives total
4. Single Bus - 1 JBOD - 2 Hosts - 24 drives total

Question 4. When do I need an external SCSI terminator (XTA-3310-SC-TERM)?

A. An external SCSI termination is only needed in the JBOD/dual-host/split SCSI bus configuration. All other configurations do not need external SCSI termination.

Question 5. How many external JBOD subsystems can the Sun StorEdge 3310 SCSI array support?

A. The Sun StorEdge 3310 SCSI array supports up to two expansion (JBOD) subsystems. The maximum configuration supports 36 drives (12 drives/system) in one RAID chassis and two expansion chassis.

Question 6. What are the hot-swappable components contained in the Sun StorEdge 3310SCSI array?

A. The RAID controllers, disk drive sled assemblies, event monitor units(EMU), and power supply/fan assemblies are all hot-swappable, field-replaceable units (FRUs). All FRUs are accessible from the front or rear of the array.

Question 7. What does the event monitor unit (EMU) do?

A. The event monitor unit monitors enclosure environmental information such as sensing various temperature sensors, obtaining voltage output status from each power supply. Auto detection of major components installed such as disk drives, fan/power supplies, and RAID controllers are also monitored by the EMU.

Question 8. Can the Sun StorEdge 3310 JBOD/Expansion units be upgraded to single or dual controllers?

A. No, the Sun StorEdge 3310 JBOD/expansion units uses a different midplane design than the RAID controller equipped array.

Question 9. How much memory does each RAID controller support? Is the memory upgradeable?

A. Each RAID controller supports 512-MB memory and this amount is fixed.

Question 10. Besides the Solaris™ 8 and 9 Operating Environment, what other operating systems are supported?

A. 1. Sun Linux 5.0
2. Windows NT 4.0, 2000 Server
3. Red Hat Linux, distribution version 7.3

Question 11. Can JBOD/expansion units be daisy-chained off each other?

A. No, expansion units can only be daisy-chained off RAID controller equipped arrays.

Question 12. How can I purchase extra AC power supplies?

A. Extra AC power supplies can be purchased through Sun Enterprise Services.

Question 13. Can rack-ready configurations be converted into desktop configurations?

A. No, they cannot.

Question 14. What is the maximum point-to-point cable length for the Sun StorEdge 3310 on any one bus?

A. 12 meters point-to-point.

Question 15. Between the terminal, GUI, and web interfaces, which interface provides the most control functionality?

A. The terminal interface "taps" directly into the RAID controller firmware, thus this interface gives users the most functionality control.

Question 16. Can a single power supply power up and support a fully populated array?

A. Yes, it can. However, there is a risk of significant downtime if that single power supply fails.

Question 17. Are the fan modules a different FRU (Field replaceable unit)?

A. No, the fan modules are incorporated into the power supply FRUs.

Question 18. Are there SCSI I/O connections on the RAID FRU?

A. No, the SCSI I/O connections are on a separate I/O FRU.

Question 19. What is the cache policy of the RAID controllers?

A. For better performance, the default setting is write back, However, the user can toggle back between write through and write back cache policies.

Question 20. Can the terminal interface be accessed point to point (from a PC to the array)?

A. Yes, users can directly connect to a Sun StorEdge 3310 array and access the terminal interface through a serial cable.

Question 21. Is array co-existence supported (for example, a Sun StorEdge A1000 and 3310 array in the same server)?

A. Yes, it is supported.

Question 22. How many agents (servers attached to Sun StorEdge 3310 array) can a single Sun StorEdge Configuration Server Console manage?

A. There is no limit to the number of servers it can manage.

Question 23. How many power supply inputs are there for each power supply module?

A. Each power supply module has one power supply input.

Question 24. What type of communications connections are on each RAID controller FRU?

A. There is a 9-pin serial port as well as a 10/100 Ethernet port for manageability.

Question 25. Which Sun Linux servers are supported by the Sun StorEdge 3310 SCSI array?

A. The Sun LX50 server is supported by the Sun StorEdge 3310 SCSI array.

Question 26. How many LUNs can a controller/controller pair support?

A. The total number of LUNs is 128, for either a single or dual controller.

Question 27. Can a RAID controller span LUNs across an expansion unit?

A. Yes it can.

Question 28. What's the factory default setting for dual controllers?

A. The default configuration is active-active controllers.

Question 29. Can dual controllers be configured in an active-passive mode?

A. Yes.

Question 30. In the event of a power failure, how many hours can the battery backup module last to support the 512-MB cache?

A. The battery backup module can support a 512-MB cache for ~72 hours.

Question 31. Can the battery backup module be upgraded to support longer hours?

A. No, the battery is fixed.

Question 32. Do any cables ship with the arrays?

A. The JBOD/expansion units ship with one 1.5-ft SCSI cable for connectivity to the RAID array. Both RAID and JBOD/expansion units come equipped with one external jumper cable that enables field configuration of single or split SCSI bus. The RAID unit also comes with a 9-pin serial cable as well as an Ethernet cable for manageability.

Question 33. How many hosts can a SE3310 support simultaneously?

A. The Sun StorEdge 3310 array supports up to two hosts simultaneously.

Question 34. Can AC-powered versions of the Sun StorEdge 3310 be converted to DC-powered?

A. Yes, users can convert the AC-powered Sun StorEdge 3310 SCSI arrays to DC power using the conversion kit, XTA-3310-DC-KIT.

Specifications

Physical Specifications

Description	Desktop	Rackmount
Height	3.64 inches	3.45 inches
Width	19 inches	17.56 inches (body)
Depth • Main chassis • Chassis with fan modules • Chassis with fan modules and handles	 18.0 inches 20.0 inches 21.0 inches	
Weight (without drives)	31.85 lb.	
Weight (fully loaded with 12 drives)	53.25 lb.	

Heat and Air Flow

- Air flow for the Sun StorEdge™ 3310 array is from front to rear.
- A fully populated array dissipates a maximum of 785 BTU per hour.

Power Input/Output

Numbers shown for the Sun StorEdge 3310 SCSI array are for a single power supply mode of operation, and these numbers are double in a dual redundant power supply mode.

AC Primary Input Voltage/Frequency Range

- Input selection is automatic, and the power supply operates continuously over the required input range.
- The power supply is capable of supplying full rated output power in the input voltage range of 100VAC to 240VAC from a single phase source.
- Input current meets the limits shown in the following table:

Input Voltage	Maximum Input Current	Maximum Inrush Current
100VAC	10A	50A peak
240VAC	5A	100A peak

Inrush current shall be less than 100A peak for 2 msec. and 30Apeak for 50 msec., at peak nominal line from a cold start. Inrush current shall be measured after the power supply has idled for a minimum of ten minutes at an ambient temperature of 25ºC, with the input voltage source removed.

DC Output Voltages/Currents/Power

- The power supply provides two DC output voltages, +5VDC and +12VDC.
- The voltage outputs are capable of supplying the output current shown in the following table, subject to a combined maximum output power of 420 Watts.

Output	Nominal Output (VDC)	Minimum	Maximum	Units	Conditions
1	5 V	0.0	35	A	
2	12 V	0.25	25	A	Peak 35A/15 sec.

- Capacitive loads: The power supply can to power up and operate normally with the following capacitances simultaneously present on the DC outputs.

Output	+12VDC	+5VDC
Capacitive load (uF)	6,000	10000

- DC input voltages/currents/power: Optional -48VDC (-36VDC to .72VDC) or -60 input capabilities available.

AC and DC Input Power Version

- **AC input power version (both power supplies operating)**
  - Nominal input voltage: 100VAC to 240VAC
  - Input voltage range: 90VAC to 264VAC
  - Input frequency range: 100-240V~ 50/60 Hz, 5.0-1.7A Per Input
- **DC input power version (both power supplies operating)**
  - Nominal input voltage: -48 or -60VDC
  - Input voltage range: -48Vdc or -60Vdc, 18A Per Input
- **Power supply output voltages**
  - +5VDC
  - +12VDC

Environmental Specifications

Feature	Specifications
Temperature	
Operating	-5ºC to 50ºC (short term, 96 hours) **Standalone** = 5ºC to 40ºC (continuous) **Rack** = 5ºC to 35ºC (continuous) MIL-STD-810F • High Temperature, Method 501.4 (+49ºC, 16 Hr dwell) • Low Temperature, Method 502.4 (-10ºC, 16 Hr dwell)

Feature	Specifications
Nonoperating	-40ºC to 65ºC MIL-STD-810F • High Temperature, Method 501.4 (+71ºC, 16 Hr dwell) • Low Temperature, Method 502.4 (-40ºC, 16 Hr dwell)
Stock	55ºC, 80% RH @ 5 hours -10ºC @ 10 hours 20ºC, 10% RH @ 5 hours
Cold Starts	5 times powered on at 2ºC MIL-STD-810F Low Temperature, Method 502.4 (Exploratory, with 2 Hr dwell at each level and the start-up at: 5ºC, 0ºC, -5ºC, -10ºC)
Humidity	
Operating	10 to 90% RH, 38ºC max. (noncondensing) MIL-STD-810F, using Method 507.4, 5 cycles total Cycle description • 95% RH @ 60ºC, 16Hr, nonoperating • 95% RH @ 30ºC, 22 Hr • 4 Hr Op • 95% RH @ 20ºC, 6 Hr, nonoperating • 95% RH @ 30ºC, 5 Hr • 4 Hr Op
Nonoperating	0% to 93% RH, 27ºC max. (non-condensing) MIL-STD-810F, using Method 507.4, 5 cycles total Cycle description • 95% RH @ 60C, 16Hr, nonoperating • 95% RH @ 30ºC, 22 Hr • 4Hr Op • 95% RH @ 20ºC, 6 Hr nonoperating • 95% RH @ 30ºC, 5 Hr • 4 Hr Op
Altitude	
Operating	70 kPa (approx. 3,000 meters) @ 40ºC, standalone 70 kPa (approx. 3,000 meters) @ 35ºC, rack MIL-STD-810F, using Method 500.4 15,000 ft @ 40ºC
Nonoperating	19.3 kPa (approx. 12,000 meters) 0ºC MIL-STD-810F, using Method 500.4 40,000 ft @ ambient temperature
Shock	
Operating	5.0 g's, 11ms, half-sine (x, y, and z axis) MIL-STD-810F, Method 516.5, Procedure I, Figure 516.5-10 3 Pulses at 5 g's 3 pulses at 14 g's 3 pulses at 20 g's (positive Saw Tooth) 3 pulses at 20 g's (negative Saw Tooth)

Feature	Specifications
Nonoperating	15 g's, 11ms, half sine (x, y, and z axis) MIL-STD-810F, Method 516.5, Procedure I, Figure 516.5-10 3 Pulses at 5 g's 3 pulses at 14 g's 3 pulses at 20 g's (positive Saw Tooth) 3 pulses at 20 g's (negative Saw Tooth) MIL-STD-810F, Bench Handling, Method 516.5, Procedure VI
Vibration	
Operating	**Standalone** = 0.20 g's, 5 Hz to 500 Hz to 5 Hz, swept-sine (5 sweeps in x, y, and z axis) **Rack** = 0.15 g's vertical and 0.1 g's horizontal, 5 Hz to 500 Hz, swept-sine MIL-STD-810F, Method 514.5, Category 21 (Watercraft – marine vehicles) 2 Hr random from 1 Hz to 100 Hz, with up to 0.0010g2
Nonoperating	**Standalone** = 1.0 g's, 5 Hz to 500 Hz to 5 Hz, swept-sine (5 sweeps in x, y, and z axis) **Rack** = 0.5 g's vertical and 0.25 g's horizontal, 1.0 Octaves per minute, 5 Hz to 500 Hz, swept-sine MIL-STD-810F, Method 514.5, Category 4 (Truck/trailer/tracked – restrained cargo) Vertical Axis: 1.04 g-rms Transverse Axis: 0.204 g-rms Longitudinal Axis: 0.704 g-rms
Inclination	15 degrees, 4 tests off the XY-plane

Compliance

Standard	Specifications
Safety	
IEC 60950 (C22.2-60950) (EN60950) (UL60950)	CUL Notice of Authorization
EMC and Safety	Telcordia GR-1089-CORE test report
Emissions and Immunities	
RF Radiated Emissions	CISPR22 (EN55022), Class B – European Union FCC Part 15, Class B – USA, Industry of Canada
Conducted Emissions	CISPR22 (EN55022), Class B – European Union FCC Part 15, Class B – USA, Industry of Canada
Harmonic Emissions	IEC 61000-3-2:2000 (No Limits) – European Union
Voltage Flicker	IEC 61000-3-3:1995/A1:2001 (No Limits)
ESD Immunity	CISPR 24 (EN55024; 8kV Contact, 15kV Air) IEC 61000-4-2
RF Field Immunity	CISPR 24 (EN55024, 10V/m) IEC 61000-4-3
Electrical Fast Transient/Burst Immunity	CISPR 24 (EN55024; 1kV I/O, 2kV Power) IEC 61000-4-5
Surge Immunity	CISPR 24 (EN55024; 1kV I/O, 1kV Power L-L, 2kV Power L-G) IEC 61000-4-5
RF Conducted Immunity	CISPR 24 (EN55024; 3V I/O and Power) IEC 61000-4-6
Power Frequency Magnetic Field Immunity	CISPR 24 (EN55024) IEC 61000-4-8
Voltage Dip and Interruption	CISPR 24 (EN55024; 0v/0.5cycle, 70%V/0.5sec, 0V/5sec)

Standard	Specifications
Voltage Dips/Short Interruptions/Voltage Variation Immunity	IEC 61000-4-11
NEBS Compliance (Environmental and Physical)	Telcordia GR-63-CORE, Level 3 (No margin requirement) (Telco, -48VDC Only) GR-1089-CORE
ETSI (Environmental and Emissions)	EN 300 386
MIL-STD-810F	Method 500.4 Altitude Method 501.4.High Temperature Method 502.4.Low Temperature Method 507.4.Humidity Method 509.4.Salt Fog Method 514.5.Category 4 Transportation Vibration Method 514.5.Category 21 Watercraft Vehicle Method 516.5.Functional Shock (15G.s operational) Method 516.5.Bench Handling
Acoustic Noise	ISO 7779:1988

Product Safety by Country

Country	Standard
U.S.	UL Listed to UL60950:2000, 3rd Edition
Canada	CSA Standard CAN/CSA-C22.2 No. 60950-00 3rd Edition
Germany	TUV
European Union	EN60950:2000
Japan	Part of World-wide CB Scheme
Australia	Part of World-wide CB Scheme
Argentina	Resolution 92-98 (S-Mark)
Germany	GS mark (ergonomics)(Rheinland)

Electromagnetic Compatibility/Interference by Country

Country	Standard
U.S.	FCC #47, Part 15, Subpart B, Class A (standalone minimum)
Canada	ICES-003
Japan	VCCI Class A
European Union	EN 55022:1998 Class A (standalone minimum)
Australia/New Zealand	AS/NZS 3548:1996
Taiwan	BSMI CNS 13438 Class A (Standalone minimum)
Germany	Same as European Union
Argentina	S mark

Enabling the Host to Boot Through the Host Adapter

This section provides procedures for enabling bootability. Bootability in this document means the ability of a host to boot from a disk, when the boot disk resides in a disk array that is connected to the host through the Sun StorEdge™ PCI Dual Ultra3 SCSI host adapter.

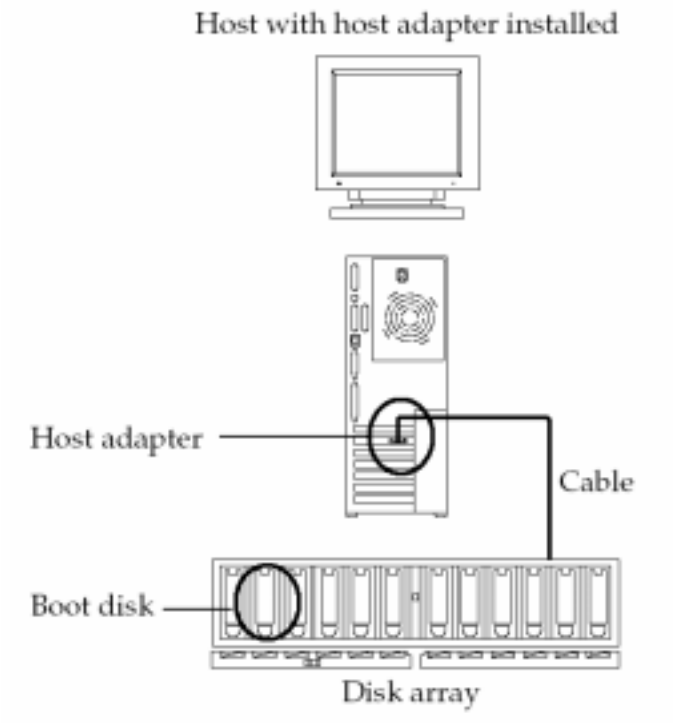

Figure 18. Host with boot disk on an array connected through the host adapter

The procedures in this section can be followed to install the driver and any patches needed for the Sun StorEdge PCI Dual Ultra3 SCSI host adapter into the Solaris™ Operating Environment on the boot disk.

The driver is not available in the current version of the Solaris Operating Environment. Therefore, the host adapter cannot be recognized by the disk's operating system unless the user enables bootability as described in this section.

Note: *Refer to the Solaris Operating Environment Release Notes for the required driver/patch combinations.*

Enabling Bootability (Options)

The table below lists the bootability procedures and identifies which procedure to use based on each site's configuration. Contact Sun support for help with other options that might be available if neither of the procedures in the table apply.

Condition	Where to Go	Notes
A host must be available on the subnet to be used as a net install or boot server.	"Enabling Bootability Using a Boot/Install Server" OR "To Enable Bootability Using a Boot/Install Server," below	This method is easier and poses a smaller risk of data loss than the following method.
No host is available to use as a boot/install server, but it is possible to connect a boot disk directly to the host (at least for the duration of the procedure).	"To Partition the New Boot Disk the Same as the Temporary Boot Disk," below	

Enabling Bootability Using a Boot/Install Server

This option installs the Solaris Operating Environment from a boot/install server onto the host with the host adapter. Any other host on the same subnet can be set up as a boot/install server.

Note: *The procedure is identical for using a boot server or an install server. Therefore, the convention used in this section is to refer to either type of server as the "boot/install server." For the distinction between these two types of server, see the Solaris Operating Environment system administration documentation.*

Installing a client from a boot/install server uses two images of the Solaris Operating Environment:

- A boot mini-root (which is referred to from here on as the boot image)
- A separate *install image* that gets copied onto the boot disk

---

Note: *While setting up the boot/install server, the user must either have the contents of the Solaris Operating Environment installation CD-ROM copied to a disk that is directly connected to the boot/install server or have the CD inserted and mounted from an attached CD-ROM device.*

The procedure "To Enable Bootability Using a Boot/Install Server," below, is needed to make both images aware of the host adapter. At the start of the procedure, the system administrator downloads the driver and all required patches to an shared directory on the boot/install server. The rest of the sequence followed in the procedure is illustrated in the figure below.

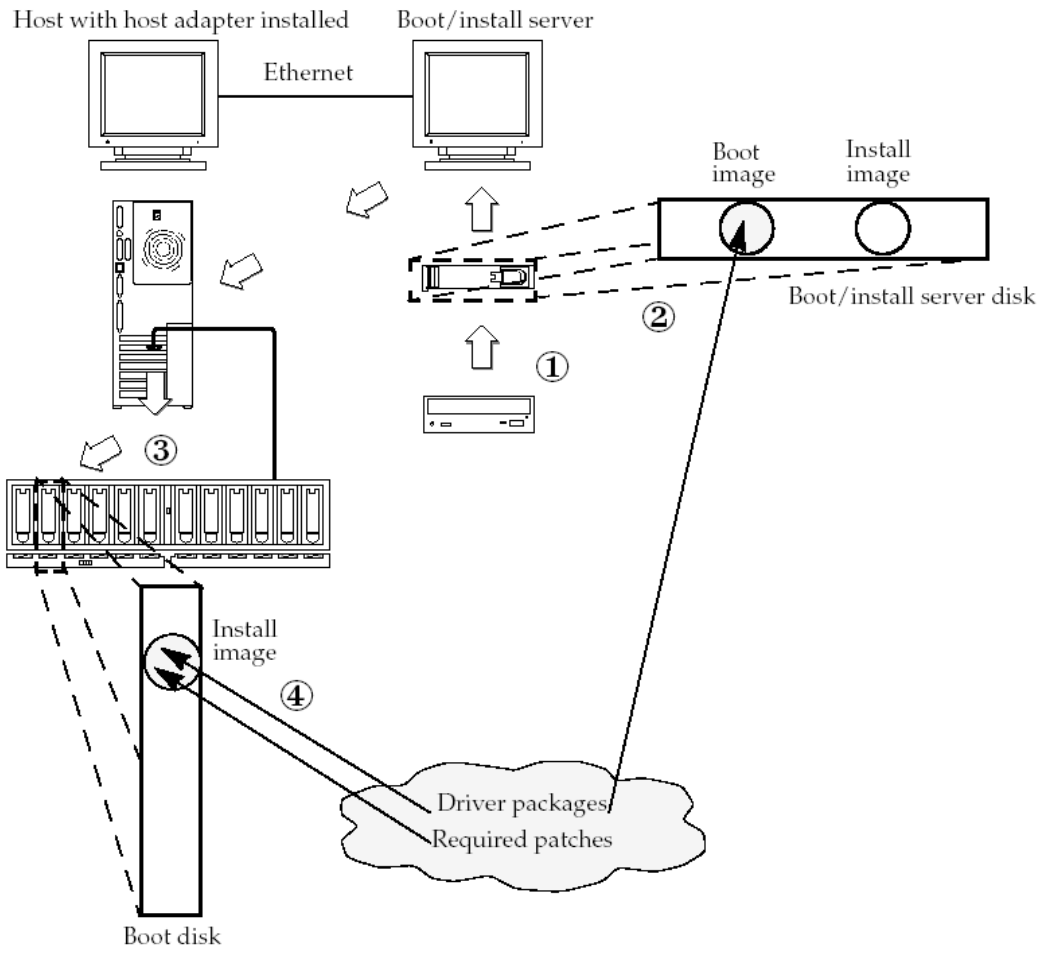

Figure 19. Installing packages and patches into the boot and install images

1. The *boot image* is copied from a Solaris Operating Environment CD-ROM or from another location onto a disk that is attached to a boot/install server. (1)
2. The driver packages are added to the boot image. (2)

   Add the driver packages to the boot image so that the boot/install server can then send and receive data through the host adapter on the boot client.
3. The client boots from the boot/install server, the interactive `suninstall(1M)` application starts, and the system administrator provides configuration information requested at the prompts.
4. After the system administrator provides all configuration information requested by the installation program, the installation of the Solaris Operating Environment begins.
5. The install image is copied to the client. (3)
6. Before a reboot, while the client is still booted from the boot image mini-root, the driver packages and all required patches are copied from the boot/install server and then installed in the *install image*. (4)

   Install the driver packages and patches into the install image so that the host can see the host adapter after a reboot.

7. The host boots from the boot disk through the host adapter.

To Enable Bootability Using a Boot/Install Server

This procedure assumes an understanding of how to install Solaris Operating Environment software over the network as described in the Solaris Operating Environment installation manuals. For more information, see the `man(1)` pages for the commands that are used in this procedure.

To Set Up the Boot/Install Server

1. Switch users to root on the host to be used as the boot/install server.

```
% su
Password:
#
```

2. Use the `setup_install_server(1M)` command from the Tools directory in the location where the Solaris Operating Environment software resides.

As shown in the following screen example, the `setup_install_server` command copies the boot image to a directory on the boot/install server. (The boot directory is named `/boot_dir` in the example.) The example shows the command being run from the Tools subdirectory on a mounted Solaris 8 Operating Environment installation CD-ROM.

```
# cd /cdrom/cdrom0/s0/Solaris_8/Tools
# ./setup_install_server -b /boot_dir
```

3. Download the driver packages and the accompanying `README` file from Sun's download center into a public shared directory in the boot image.

This example uses the `/public` directory. Whatever directory used must be shared. This example uses the `share(1M)` command with the name of the `/public` directory on the command line. See the Solaris Operating Environment system administration documentation and the `share(1M)` and `dfstab(4)` man pages, if needed, for other options on how to share a directory.

a. Make sure that the public directory where the package is to be placed is shared.

This example shows using the share command to share the `/public` file system, and the output of the `share` command showing that the `/public` directory was successfully shared.

```
# share /public
# share
-               /spare   rw   "D2 dir"
-               /public   rw   "" /public
```

b. Refer to the instructions on how to download the Sun StorEdge PCI Dual Ultra3 SCSI QUS driver in the release notes, and go to the download center at the location specified.

c. Download the `README` file.

d. Remove any previously-installed packages for this host adapter as instructed in the `README`.

e. Download the packages into the public shared directory. In this example, the packages would be installed into `/public`**.**

f. Use the `uncompress(1M)` **and** `tar(1M)` **commands to uncompress and expand the packages from the** `tar` **file, as instructed in the** `README`**.**

Caution: *Do not use the version of the* `pkgadd(1M)` *command line that is given in the* `README` *to install the packages. After Step 4, install relocatable versions of the packages using the command line given in Step 5.*

g. Go to Step 4.

4. Download the required patch(es) and the accompanying `README` **file(s) from** `http://sunsolve.sun.com` **into a public directory on the boot/install server.**

a. See the release notes for a list of required patches.

b. Make sure that the public directory where the patches will be put is shared.

This example shows using the share command to share the `/public` file system, and the output of the `share` command showing that the `/public` directory was successfully shared.

```
# share /public
# share
-               /spare   rw   "D2 dir"
-               /public   rw   "" /public
```

c. Refer to the the instructions on how to download the Sun StorEdge PCI Dual Ultra3 SCSI QUS required patch(es) in the release notes, and go to the download center at the location specified.

d. Download the `README` **file.**

e. Remove any previously installed related patches that may be specified in the `README`**.**

f. Download the patch(es) into the public directory following the instructions in the release notes.

In this example, the patch(es) would be installed into `/public`.

g. Use the `uncompress(1M)` **and** `tar(1M)` **commands to uncompress and expand the patch(es) from the** `tar` **file, as instructed in the** `README`**.**

Caution: *Do not use the* `patchadd(1M)` *command line that is given in the* `README` *to install the patch(es). After Step 5, install relocatable versions of the patch(es) using the command line given in Step 6.*

h. Go to Step 5.

5. Install the driver packages into the boot image.

The following example installs all packages previously downloaded into the public (`/public`) directory.

```
# cd /public
# pkgadd -R /boot_dir/Solaris_8/Tools/Boot -d .
```

6. **Install all required patches into the boot image.**

   The following example installs all patches that were previously downloaded into the public (`/public`) directory.

```
# cd /public
# patchadd -R /boot_dir/Solaris_8/Tools/Boot -d .
```

7. **Make sure the host name, its IP address, and its Ethernet address have been added to the name service (`/etc` files, NIS, or NIS+).**

8. **Run the `add_install_client(1M)` command to add the host with the host adapter as a boot/install client.**

   The example shows the `add_install_client` command followed by the name of the host `sunny` followed by its platform name, `sun4u`. (`sunny` is the client with the host adapter installed.)

```
# add_install_client sunny sun4u
```

Note: *To find the platform name, run the `uname` command with the `-m` option on the host that has the host adapter.*

---

9. **Log out of the boot/install server.**

To Set Up the Client

1. **Bring the client host (with the host adapter) down to the `ok` prompt at run level 0.**

   See the Solaris Operating Environment system administration documentation for the commands that can be used with different configurations. The following example uses the `shutdown(1M)` command.

```
# shutdown
...
ok
```

Caution: *Do not reboot the boot/install server.*

2. **Boot the host from the net.**

```
ok boot net
```

   The Solaris Operating Environment interactive installation program runs from the boot/install server.

3. **Respond to the prompts according to the system's configuration, as instructed in the Solaris Operating Environment installation guide.**

   Make sure to specify the new boot disk as the destination for the operating environment installation.

4. **When prompted to choose between automatic reboot or manual reboot, click the Manual Reboot button, complete the remaining question, and start the installation.**

   This question offering a choice between automatic and manual reboot is the last question before the installation starts.

5. **Mount the public directory which contains the driver packages and any needed patches onto the `/mnt` directory mount point.**

   Enter the mount command followed by the hostname of the boot/install server, followed by a colon (`:`), followed by the name of the public directory followed by `/mnt`. The following example uses `boot_install_server` as the name of the boot/install server and `/public` as the name of the public directory.

```
# mount boot_install_server:/public /mnt
```

6. **Install the driver packages into the install image.**

   The following example installs all packages previously downloaded into the `/public` directory.

```
# cd /mnt
# pkgadd -R /a -d .
```

7. **Install all required patches into the boot image.**

   The following example installs all patch(es) that were previously downloaded into the `/public` directory.

```
# cd /mnt
# patchadd -R /a -d .
```

8. **Bring the system down to the `ok` prompt at run level 0.**
9. **Reboot the host from the newly installed operating environment.**

```
ok boot -r
```

Enabling Bootability Using a Directly Connected Temporary Boot Disk

For this procedure to work, a boot disk must be directly connected (at least temporarily) to the host. The boot disk must have the following installed:

- The Solaris Operating Environment
- The driver packages and all required patches

  See the release notes for how to download and install the driver packages and all required patches.

***Note:** The initial boot disk can be removed if it is not needed after the boot disk is enabled.*

To Enable Bootability Using a Directly Connected Boot Disk

To enable bootability using a directly-connected boot disk, perform the procedures described in the table below.

Task	Procedure
Partition the new boot disk the same as the temporary boot disk.	"To Partition the New Boot Disk the Same as the Temporary Boot Disk"
Create a file system on each new partition.	"To Create File Systems on the New Boot Disk"
Install the boot block and copy the root file system on the new disk.	"To Copy the Boot Block and Root File System Contents onto the New Boot Disk"
Copy the install image from system disk to the new boot disk.	"To Copy the Contents of Non-root File Systems onto the New Boot Disk"
Replace the name of the temporary boot disk with the name of the new boot disk in the `vfstab(4)` file.	"To Update the `vfstab` File"
Redefine the boot disk and reboot.	"To Specify the New Boot Disk as the Boot Device"

Note: *The examples show disk 0 as the directly-connected boot disk, and disk 1 as the designated new boot disk that is connected through the host adapter.*

To Partition the New Boot Disk the Same as the Temporary Boot Disk

1. **Switch users to root on the host with the host adapter.**

```
% su
Password:
#
```

2. **If the driver and any needed patches are not already installed, download the driver package from Sun's download center and install it on the host, following the instructions in the `README` file that comes with the driver.**

   To download the driver, follow the instructions in the release notes.

3. **Reboot using the `reboot(1M)` command with the `-r` option.**

```
# reboot -- -r
```

4. **Log into the host as root.**
5. **Record the layout of the partitions (slices) on the system boot disk.**
   a. **Enter the `format(1M)` command.**

      If needed, refer to the `format` man page and the instructions on adding a disk and using the `format` command in the Solaris Operating Environment administration documentation.

Note: *These examples use disk 0 as the temporary disk (`c0t0d0`) and disk 1 (`c3t8d0`) as the new boot disk.*

```
# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c0t0d0 <SUN4.2G cyl 3880 alt 2 hd 16 sec 135>
          /pci@1f,4000/scsi@3/sd@0,0
       1. c3t8d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@1f,4000/pci@4/scsi@4/sd@8,0
       2. c3t9d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@1f,4000/pci@4/scsi@4/sd@9,0
       3. c3t10d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@1f,4000/pci@4/scsi@4/sd@a,0
       4. c3t11d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@1f,4000/pci@4/scsi@4/sd@b,0
       5. c3t12d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@1f,4000/pci@4/scsi@4/sd@c,0
       6. c3t13d0 <SUN36G cyl 24620 alt 2 hd 27 sec 107>
          /pci@1f,4000/pci@4/scsi@4/sd@d,0
Specify disk (enter its number):
```

b. Make a note of the device pathname of the new boot disk.

For example, for disk 1, the new boot disk in this example, the device pathname shown is: `/pci@1f,4000/pci@4/scsi@4/sd@8,0`. This information can be used later in Step 4 in "To Specify the New Boot Disk as the Boot Device."

c. Specify the disk where the operating system is installed on the temporary boot disk.

The following screen example specifies disk 0.

```
Specify disk (enter its number): 0
```

d. Enter the `partition` command to bring up the `PARTITION MENU`.

```
format> partition
PARTITION MENU:
        0       - change ‘0’ partition
        1       - change ‘1’ partition
        2       - change ‘2’ partition
        3       - change ‘3’ partition
        4       - change ‘4’ partition
        5       - change ‘5’ partition
        6       - change ‘6’ partition
        7       - change ‘7’ partition
        select  - select a predefined table
        modify  - modify a predefined partition table
        name    - name the current table
        print   - display the current table
        label   - write partition map and label to the disk
        !<cmd>  - execute <cmd>, then return
        quit
partition>
```

e. Enter the `print` command to display the partition table for the specified disk.

```
partition> print
Current partition table (original):
Total disk cylinders available: 3880 + 2 (reserved cylinders)

Part      Tag    Flag     Cylinders        Size            Blocks
  0     root    wm     0 - 1937        2.00GB  (1938/0/0) 4186080
  1     swap    wu     1938 - 2908     1.00GB   (971/0/0) 2097360
  2    backup    wm     0 - 3879       4.00GB  (3880/0/0) 8380800
  3 unassigned    wm     0                 0     (0/0/0)          0
  4 unassigned    wm     0                 0     (0/0/0)          0
  5 unassigned    wm     0                 0     (0/0/0)          0
  6 unassigned    wm     0                 0     (0/0/0)          0
  7      home    wm     2909 - 3879     1.00GB (971/0/0)  2097360
```

In the example, the temporary boot disk has three slices defined: 0 (root), 1 (swap), and 7 (home) with sizes, 2.00GB, 1.00GB, and 1.00GB.

f. Record the layout (sizes and numbers) assigned to the slices on the temporary boot disk, and enter `quit` when done.

```
partition> quit
FORMAT MENU:
        disk        - select a disk
        type        - select (define) a disk type
        partition   - select (define) a partition table
        current     - describe the current disk
        format      - format and analyze the disk
        repair      - repair a defective sector
        label       - write label to the disk
        analyze     - surface analysis
        defect      - defect list management
        backup      - search for backup labels
        verify      - read and display labels
        save        - save new disk/partition definitions
        inquiry     - show vendor, product and revision
        volname     - set 8-character volume name
        !<cmd>      - execute <cmd>, then return
        quit
format>
```

As shown in the previous example, the quit command returns to the `FORMAT MENU`.

6. Specify one slice on the new boot disk for every slice on the temporary boot disk.

The following examples specify the root slice 0 on the new boot disk to match slice 0 on the temporary boot disk.

a. At the `format>` prompt, use the disk command to start laying out the new boot disk.

Enter the `disk` command followed by the number of the disk to be formatted. The following screen example uses `disk 1`.

```
format> disk 1
selecting c3t8d0
[disk formatted]

FORMAT MENU:
        disk         - select a disk
        type         - select (define) a disk type
        partition    - select (define) a partition table
        current      - describe the current disk
        format       - format and analyze the disk
        repair       - repair a defective sector
        label        - write label to the disk
        analyze      - surface analysis
        defect       - defect list management
        backup       - search for backup labels
        verify       - read and display labels
        save         - save new disk/partition definitions
        inquiry      - show vendor, product and revision
        volname      - set 8-character volume name
        !<cmd>       - execute <cmd>, then return
        quit
format>
```

As shown in the previous example, the `FORMAT MENU` displays.

b. Make a note of the device name of the disk.

The disk's device name in the previous screen example is `c3t8d0`.

c. Enter the `partition` command to bring up the `PARTITION MENU`.

```
format> p
PARTITION MENU:
        0        - change ‘0’ partition
        1        - change ‘1’ partition
        2        - change ‘2’ partition
        3        - change ‘3’ partition
        4        - change ‘4’ partition
        5        - change ‘5’ partition
        6        - change ‘6’ partition
        7        - change ‘7’ partition
        select   - select a predefined table
        modify   - modify a predefined partition table
        name     - name the current table
        print    - display the current table
        label    - write partition map and label to the disk
        !<cmd>   - execute <cmd>, then return
        quit
partition>
```

d. Enter the number of the slice to be defined.

Slice 0 is specified in the following example. As shown, the partition table for the new boot disk displays.

```
partition> 0
Current partition table (original):
Total disk cylinders available: 24620 + 2 (reserved cylinders)
Part       Tag    Flag     Cylinders      Size            Blocks
  0       root     wm       0 -    90   128.37MB   (91/0/0)      262899
  1       swap     wu      91 -   181   128.37MB   (91/0/0)      262899
  2     backup     wu       0 - 24619    33.92GB   (24620/0/0) 71127180
  3 unassigned     wm       0             0        (0/0/0)            0
  4 unassigned     wm       0             0        (0/0/0)            0
  5 unassigned     wm       0             0        (0/0/0)            0
  6        usr     wm     182 - 24619    33.67GB   (24438/0/0) 70601382
  7 unassigned     wm       0             0        (0/0/0)            0
Enter partition id tag[root]:
```

e. Enter the partition ID tag.

The following example shows a question mark (?) entered after the prompt. The list of accepted partition id tags displays. The example then shows the default partition id tag of root accepted by pressing the `Return` key.

```
Enter partition id tag[root]: ?
Expecting one of the following: (abbreviations ok):
        unassigned    boot          root          swap
        usr           backup        stand         var
Enter partition id tag[root]:
Enter partition permission flags[wm]:
```

f. Enter the partition permission flags.

The following example shows the default permission flags wm accepted by pressing the `Return` key.

```
Enter partition permission flags[wm]:
Enter new starting cyl[0]:
```

g. Enter the new starting cylinder.

The following example shows the default new starting cylinder of `0` accepted by pressing the `Return` key.

```
Enter new starting cyl[0]:
Enter partition size[262899b, 91c, 128.37mb, 0.13gb]:
```

h. Enter the partition size.

The following example shows the partition size of `2.00gb` entered.

```
Enter partition size[262899b, 91c, 128.37mb, 0.13gb]: 2.00gb
partition>
```

i. Enter the `print` command to display the updated partition table.

The following example shows that the `root` tag, the `wm` permissions flag, and the partition size of `2.00GB` are assigned to slice 0.

```
partition> print
Current partition table (unnamed):
Total disk cylinders available: 24620 + 2 (reserved cylinders)

Part       Tag    Flag   Cylinders        Size                Blocks
  0       root    wm       0 - 1451       2.00GB  (1452/0/0)   4194828
  1       swap    wu      91 - 181      128.37MB  (91/0/0)      262899
  2     backup    wu     0 - 24619       33.92GB  (24620/0/0) 71127180
  3 unassigned    wm             0             0  (0/0/0)           0
  4 unassigned    wm             0             0  (0/0/0)           0
```

j. Repeat Step d through Step i as needed until all slices are defined as they are in the temporary boot disk.

k. Enter the `quit` command to return to the `FORMAT MENU`.

```
partition> quit

FORMAT MENU:
        disk        - select a disk
        type        - select (define) a disk type
        partition   - select (define) a partition table
        current     - describe the current disk
        format      - format and analyze the disk
        repair      - repair a defective sector
        label       - write label to the disk
        analyze     - surface analysis
        defect      - defect list management
        backup      - search for backup labels
        verify      - read and display labels
        save        - save new disk/partition definitions
        inquiry     - show vendor, product and revision
        volname     - set 8-character volume name
        !<cmd>      - execute <cmd>, then return
        quit
format>
```

7. Label the new boot disk with the new partition table.

a. Enter the label command.

```
format> label
```

b. Enter y[es] to continue.

```
Ready to label disk, continue? y
```

c. When the labeling is complete, enter q[uit] to quit the `format` program.

```
format> q
#
```

To Create File Systems on the New Boot Disk

- **Create a file system on each slice on the disk using the `newfs(1M)` command.**

  Enter the `newfs` command followed by the device name of the slice. In this example, the device name for slice 0 of disk `c3t8d0` is `/dev/rdsk/c3t8d0s0`.

```
# newfs /dev/rdsk/c3t8d0s0
newfs: construct a new file system /dev/rdsk/c3t8d0s0: (y/n)? y
/dev/rdsk/c3t8d0s0:    4194828 sectors in 1452 cylinders of 27 tracks,
107 sectors
         2048.3MB in 46 cyl groups (32 c/g, 45.14MB/g, 7488 i/g)
super-block backups (for fsck -F ufs -o b=#) at:
32, 92592, 185152, 277712, 370272, 462832, 555392, 647952, 740512,
833072,
925632, 1018192, 1110752, 1203312, 1295872, 1388432, 1480992, 1573552,
1666112, 1758672, 1851232, 1943792, 2036352, 2128912, 2221472, 2314032,
2406592, 2499152, 2591712, 2684272, 2776832, 2869392, 2958368, 3050928,
3143488, 3236048, 3328608, 3421168, 3513728, 3606288, 3698848, 3791408,
3883968, 3976528, 4069088, 4161648,
```

  For more information, see the section on how to create file systems in the Solaris Operating Environment system administration documentation.

  Do this step to create a file system on the new boot disk for every slice on the temporary boot disk. When finished, refer to the section "To Copy the Contents of Nonroot File Systems onto the New Boot Disk," below.

To Copy the Boot Block and Root File System Contents onto the New Boot Disk

1. **Install the boot block on the root (/) file system of the new disk.**

   The following example uses the `installboot(1M)` command to install the boot block. The boot block resides in the `/usr/platform/`*platform_name*`/lib/fs/ufs/bootblk` directory. The example shows invoking the uname command with the `-i` option between left single quotes on the command line to specify the platform name.

```
# /usr/sbin/installboot /usr/platform/‘uname -i‘/lib/fs/ufs/bootblk \
/dev/rdsk/c3t8d0s0
```

   For more information, see the instructions on how to install a boot block in the Solaris Operating Environment system administration documentation.

2. **Mount the root file system from slice 0 of the new boot disk onto the `/mnt` mount point.**

```
# mount /dev/dsk/c3t8d0s0 /mnt
```

3. **Use the `ufsdump(1M)` and `ufsrestore(1M)` commands to copy the contents of the root file system from the temporary boot disk to the root slice of the new boot disk (on the `/mnt` mount point).**

```
# ufsdump 0f - /dev/rdsk/c0t0d0s0 | ( cd /mnt; ufsrestore rf -)
  DUMP: Writing 32 Kilobyte records
  DUMP: Date of this level 0 dump: Tue 19 Feb 2002 02:44:35 PM PST
  DUMP: Date of last level 0 dump: the epoch
  DUMP: Dumping /dev/rdsk/c3t8d0s0 (hba2-81:/) to standard output.
  DUMP: Mapping (Pass I) [regular files]
  DUMP: Mapping (Pass II) [directories]
  DUMP: Estimated 1818082 blocks (887.74MB).
  DUMP: Dumping (Pass III) [directories]
  DUMP: Dumping (Pass IV) [regular files]
Warning: ./lost+found: File exists
  DUMP: 88.77% done, finished in 0:01
  DUMP: 1818046 blocks (887.72MB) on 1 volume at 1363 KB/sec
  DUMP: DUMP IS DONE
#
```

4. **Unmount the root file system on slice 0 from the `/mnt` mount point.**

```
# umount /mnt
```

To Copy the Contents of Non-root File Systems onto the New Boot Disk

1. **Mount the file system onto the `/mnt` mount point.**

   This example shows the copying of the `/home` file system from slice 7 to the new boot disk.

```
# mount /dev/dsk/c3t8d0s7 /mnt
```

2. **Use the `ufsdump(1M)` and `ufsrestore(1M)` commands to copy the contents of the file system from the temporary boot disk to the new boot disk.**

```
# ufsdump 0f - /dev/rdsk/c0t0d0s0 | ( cd /mnt; ufsrestore rf -)
  DUMP: Writing 32 Kilobyte records
  DUMP: Date of this level 0 dump: Tue 19 Feb 2002 02:44:35 PM PST
  DUMP: Date of last level 0 dump: the epoch
  DUMP: Dumping /dev/rdsk/c3t8d0s0 (hba2-81:/) to standard output.
  DUMP: Mapping (Pass I) [regular files]
  DUMP: Mapping (Pass II) [directories]
  DUMP: Estimated 1818082 blocks (887.74MB).
  DUMP: Dumping (Pass III) [directories]
  DUMP: Dumping (Pass IV) [regular files]
Warning: ./lost+found: File exists
  DUMP: 88.77% done, finished in 0:01
  DUMP: 1818046 blocks (887.72MB) on 1 volume at 1363 KB/sec
  DUMP: DUMP IS DONE
#
```

3. **Unmount the file system from the `/mnt` mount point.**

```
# umount /mnt
```

4. **Repeat Step 1 through Step 3 as needed until all the file systems' contents are copied to the new boot disk. When finished, go to "To Update the `vfstab` File," below.**

To Update the `vfstab` File

1. **Mount the root file system from slice 0 of the new boot disk onto the `/mnt` mount point.**

```
# mount /dev/dsk/c3t8d0s0 /mnt
```

2. **Change directories to `/mnt/etc` and open the `vfstab(4)` file for editing.**

   The following example shows the file systems defined.

```
# cd /mnt/etc
# vi vfstab

...
/dev/dsk/c0t0d0s1      -       -       swap    -       no      -
/dev/dsk/c0t0d0s0      /dev/rdsk/c0t0d0s0      /       ufs     1       no -
/dev/dsk/c0t0d0s7      /dev/rdsk/c0t0d0s7      /home   ufs     2       yes -
```

3. **Replace the name of the temporary boot disk with the name of the new boot disk, and then save and quit the file.**

   The following example shows the disk name `c0t0` changed to `c3t8` in the mount table entries for slices 0, 1, and 7.

```
/dev/dsk/c3t8d0s1      -       -       swap    -       no      -
/dev/dsk/c3t8d0s0      /dev/rdsk/c3t8d0s0      /       ufs     1       no -
/dev/dsk/c3t8d0s7      /dev/rdsk/c3t8d0s7      /home   ufs     2       yes -
:wq
#
```

4. **Unmount the file system from the `/mnt` mount point.**

```
# umount /mnt
```

To Specify the New Boot Disk as the Boot Device.

1. **Bring the host with the host adapter down to the `ok` prompt at run level 0.**

   See the Solaris Operating Environment system administration documentation on shutting down a host for the commands that can be used with different configurations. The following screen example uses the `shutdown(1M)` command.

```
# shutdown
...
ok
```

2. **Use the `nvalias` command to alias the device name of the disk to a short name for the disk.**

   The following example uses **`/pci@1f,4000/pci@4/scsi@4/sd@8,0`**, which was noted as the device path name for disk 1 in Step 5.

```
ok nvalias disk1 /pci@1f,4000/pci@4/scsi@4/sd@8,0
```

3. **Use the `nvstore` command to store the new alias followed by the `reset all` command.**

```
ok nvstore
ok reset-all
```

4. **Define the new boot disk as the default `boot-device`.**

   a. **Enter the `setenv` command followed by the `boot-device` parameter followed by the name of the new disk.**

```
ok setenv boot-device disk1
```

   b. **Enter the `reset` command.**

```
ok reset
```

5. **Enter the `boot` command with the `-r` option so that the host adapter can be recognized located by the Solaris Operating Environment.**

```
ok boot -r
```

Warranty, Service, and Support

Warranty

The Sun StorEdge™ 3310 SCSI array comes with a 2-year warranty: 1st year, second business day, on-site. 2nd year, 15-day parts exchange.

Support Contracts

The SunSpectrum℠ program is an innovative and flexible service offering that allows customers to choose the level of service best suited to their needs, ranging from mission-critical support for maximum solution availability to backup assistance for self-support customers. The SunSpectrum program provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Solaris™ Operating Environment software, and telephone support for Sun™ software packages. The majority of Sun's customers today take advantage of the SunSpectrum program, underscoring the value that it represents. Customers should check with their local Sun Enterprise Services representatives for program and feature availability in their areas.

The four levels of SunSpectrum support contracts are outlined below.

SunSpectrum Program Support

Program	Description
Mission-Critical SunSpectrum Platinum℠ Support	Designed to support client-server, mission critical solutions by focusing on failure prevention, rapid recovery and year round technical services planning. Support is provided 24 x 7.
Business-Critical SunSpectrum Gold℠ Support	Includes a complete package of proactive and responsive services for customers who require maximum uptime for their strategic business-critical systems. Support is provided 24 x 7.
System Coverage SunSpectrum Silver℠ Support	Combines the service expertise, responsive on-site support and technical support by telephone and SunSolve™ CD/on-line services. Support is provided 8 a.m. to 8 p.m. Mon. through Fri.
Self-Directed SunSpectrum Bronze℠ Support	Provided for customers who rely primarily upon their own in-house service capabilities. Enables customers to deliver high quality service by giving them access to UNIX® expertise, Sun certified replacement parts, software releases and technical tools. Support is provided 8 a.m. to 5 p.m. Mon. through Fri.

Professional Services

Sun StorEdge Array Installation Service

This service includes site preparation review, installation planning, installation, configuration verification, and system turnover for one Sun StorEdge SE3310 array product. The specific tasks and deliverables included in this service are:

- Site preparation review including environmental states.
- On-site installation planning including schedule and resources.
- Development of System Installation Specification including RAID characteristics and recommendations.
- Verify supported configuration and customer sign-off to start installation.
- Installation of array hardware and cabling.
- Installation of array software and patches.
- Configuration and customization of the array including RAID levels and logical volumes.
- Verification of installation and array functionality.
- System turnover.

Glossary

Active Termination, Regulated	Terminates the SCSI bus with a series of resistors tied to +5 volts. The terminator is labeled Regulated but is often referred to as an Active Terminator.
Bandwidth	A measure of the capacity of a communication channel, usually specified in MB/second.
Cache	Memory on the RAID controller card which permits intermediate storage of read and write data without physically reading/writing from/to the disk, which can increase overall performance under certain conditions.
CLI	Command line interface.
Concatenated Channel	Inside the same drive array enclosure, a single contiguous drive channel supporting 12 drives concurrently
Device Name	Software device address that identifies the controller/LUN, such as cXtYdZs0, where X is the host bus adapter, Y is the controller, and Z is the LUN. s0 slice number is used by the system, not by RAID Manager.
Disk Array	Two or more drives configured as a Drive Group (see next).
Drive Group	A physical set of drives configured as an array. Drive groups are defined during configuration.
Expansion Drive Array	An enclosure containing a group of drives, power supplies, cooling fans, I/O cards, and midplanes (no RAID controller/controllers); generally, an external drive array that is used to daisy-chain to an existing hardware-based RAID configuration.
Fast Write	Allows disk write commands to be safely acknowledged to the host before the data is actually written to the disk media. This can be enabled/disabled through the storage management software.
Fast/wide SCSI	Data transfer rate of 20 MB/sec. Wide devices can be connected to a standard SCSI interface but the extra data lines need to be terminated.
Full-Duplex	Data transmission in both directions at the same time. See also Half-duplex and Simplex.
Half-Duplex	Refers to an interface, such as SCSI, that can transmit data in only one direction at a time. See also Full-duplex and Simplex.
Host Bus Adapter	A card that connects a peripheral device to the computer system's I/O bus.
Hot Plug	The ability to remove, replace, or add a device while current I/O processes continue.
Hot-serviceable	The ability to remove, replace or add a device while power is still applied but all I/O processes are suspended.
Hot Spare or Hot Sparing	A drive in an array that is held in reserve to replace any other drive that fails. After a reconstruction, the hot-spare drive is returned to the standby status.

Hot-swap or Hot-swappable	A specific case of hot-plug which involves replacing a device with another of the same size, type, and layout, without any notification to the operating environment.
IOPS	Input/output operations per second. A measure of I/O performance, this is usually used to quote random I/O performance. See throughput.
JBOD	Just a Bunch Of Disks. JBOD refers to a group of drives without an embedded RAID controller; generally, such a group is used without RAID formatting, with a host-based hardware RAID controller, or with RAID formatting from host software (with no hardware-base RAID controller)
LUN	Logical unit number. A LUN is a set of physical drives in a RAID configuration which are seen by the operating system as one virtual drive.
MTBF	Mean time between failures. A measure of reliability, this is the average expected time between failures of equipment, usually measured in operating hours.
MTBDL	Mean time between data loss. In a RAID system, this is the average expected time between two rapid disk failures that would cause irreparable data loss.
MTTR	Mean time to repair. A measure of availability, this is the average time the system is out of commission to complete a repair process.
Parity	Additional information stored along with the data that allows the controller to reconstruct lost data on RAID 3 or 5 LUNs if a single drive fails.
Reconstruction	Process used to restore a degraded RAID 1, 3, or 5 LUN to its original state after replacing a single failed drive.
RDAC	Redundant disk array controller. The RDAC driver is included in the RAID Manager software, and manages the rerouting of active I/O operations when a controller fails.
RAID	Redundant Array of Independent Disks. A RAID is a set of disk drives appearing as a single logical disk drive to a system host. Different RAID levels provide different capacity, performance, availability, and cost characteristics.
RAID Controller Drive Array	An enclosure containing one or two RAID controllers, a group of drives, power supplies, cooling fans, I/O cards, and midplanes.
RAS	Reliability, availability, and serviceability. Features that enhance these attributes, including hot-pluggable capability and redundancy, are important for keeping mission-critical applications and data on-line.
SAF-TE	SCSI Accessed Fault-Tolerant Enclosures.
SCA	Single connector attachment. A SCSI disk connector technology co-invented by Sun Microsystems. The SCA provides all SCSI, power, and control signals in a single connector, and enables easy servicing and highly reliable, pluggable disk drives.
SCSI Address	The octal representation of the unique address (0–7) assigned to a narrow device; or hex representation of the unique address (0–15) assigned to a wide SCSI device.

Simplex	Transmission in one preassigned direction only. See also Full-duplex and Half-duplex.
SNMP	Simple network management protocol. SNMP enables RAID events to be remotely monitored by designated network management stations.
Split Channel	Inside the same drive array enclosure, when the drive channel is evenly divided into two separate channels; for example, when a 12-drive channel is cleaved into two independent channels
Striping	Spreading, or interleaving, logically contiguous blocks of data across multiple independent disk spindles. The amount of data written on each disk before moving to the next drive is the stripe width.
Throughput	A measure of sequential I/O performance, quoted in MB/sec. See IOPS.
Volume	In VERITAS Volume Manager software, a volume is a virtual disk partition into which a file system, DBMS, or other application can place data. A volume can physically be a single disk partition or multiple disk partitions on one or more physical disk drives. Applications that use volumes do not need to be aware of their underlying physical structure. The VERITAS Volume Manager software handles mapping of virtual partition addresses to physical addresses.
Warm Plug	The ability to remove, replace or add a device while power is still applied but all I/O processes are suspended.
Ultra160 SCSI LVD	Ultra 3 SCSI command set plus a raw data rate of 160 MB/sec. plus the ability to connect up to a distance of 12m (Low Voltage Differential)
XOR	eXclusive OR. A binary mathematical operation performed on data to produce parity information. In RAID levels 3 and 5, parity is generated from the user data, stored, and used to regenerate lost data if a drive failure occurs.